AZ VORTEX

Multipod v.2.0

www.rockexotica.com

Written and illustrated by Reed Thorne, Ropes That Rescue Ltd.
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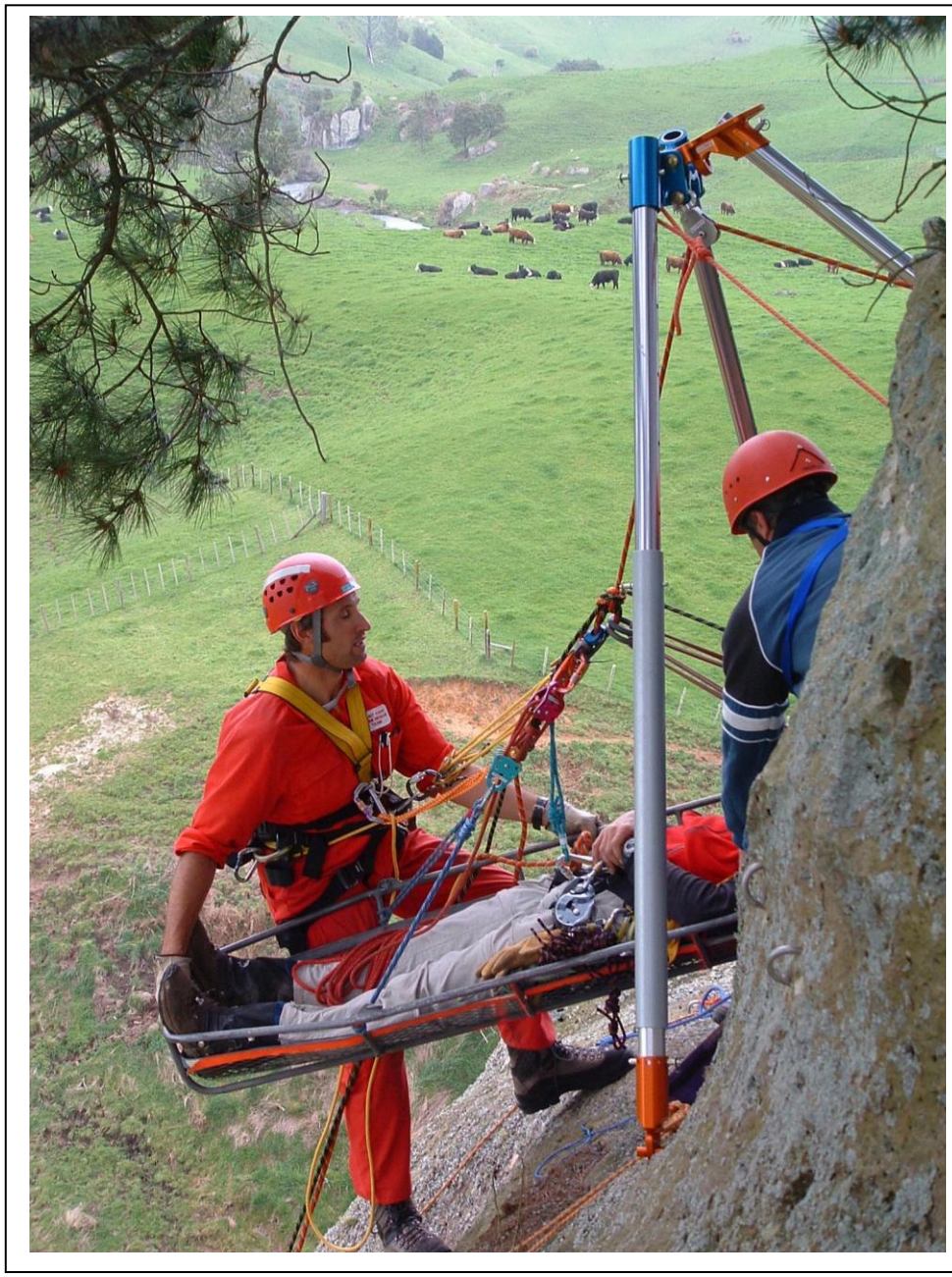

Rock Exotica

AZ VORTEX

MULTIPOD v.2.0

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AZ VORTEX GENERAL WARNINGS and CE CERTIFICATION

rock exotica
EXPERT USE ONLY

WARNING
For dangerous activities-risk of injury/death cannot be eliminated. There are many ways to misuse this equipment; it is the user's responsibility to obtain specific and proper training and use this gear safely. These instructions cannot teach you everything you need to know. Do not use unless you can and will assume all risks and responsibilities for all damage/injury/death that may result from use of this equipment or the activities you undertake with it. Read all instructions. Carefully check gear before each use. Always use suitable backup systems-never trust a life to a single tool!

MARKING ON THE PRODUCT
The Vortex head, on the orange part, is marked as follows: "CE 1019 EN 795:1998", "WARNING: For Dangerous Situations. Risk of Death/Injury Cannot Be Eliminated. Use of this device requires specialized skills and training." It also has the assembly date, serial number and an icon reminding users to read instructions.

CE Certification Notified Body
Conformity assessment was done by notified body No. 1019, VVUU, a.s., Pikartska 1337/7, 716 07 Ostrava-Radvanice, Czech Republic. Notified body controlling the manufacturing of the product: Notified body No. 1019, VVUU, a.s., Pikartska 1337/7, 716 07 Ostrava-Radvanice, Czech Republic.

Country of Origin
Rock Exotica products are made in the USA of domestic and foreign materials. The Vortex design is Patent Pending.

Lifetime
It is impossible to give a definite lifetime. While carefully used gear may last a long time, one extreme or improper use could require that it is retired. Cracks, corrosion, deformation, wear, failure to properly function, major falls, any doubt as to prior usage or condition all require that the equipment is retired and destroyed. In addition to inspections before and during use, a competent person must conduct a detailed inspection every 12 months minimum. A record should be kept of the date, inspector and results and date of first use, name of users and any other pertinent information necessary to keep accurate track of the equipment's usage history.

Storage
Store in a dry place away from extremes of heat and cold and avoid exposure to chemicals.

Disclaimer
We are not responsible for direct, indirect, or accidental consequences, or any other damage occurring or resulting from the use of our products.

VORTEX SPECIFICATIONS & WARNINGS

SPECIFICATIONS

- Inside height clearance in regular tripod configuration: 9 ft. (2.7 m)
- Horizontal clearance at foot level in 9 ft. height configuration: 8 ft. 9 in. (2.6 m)
- Height with additional legs: 12 ft. (3.7m)
- System weight: 62 lbs. (28 kg)
- Pin strength: Double Shear strength of the quick release pins is over 50 kN
- Safe Working Load: 600 lbs. (2.7 kN)

WARNINGS

When performing rescue, climbing or work within the vertical realm, the risk of injury or death cannot be eliminated. Do not use this device unless you have:

- Read all instructions and warnings
- Received competent and suitable training
- Trained your entire team on the proper use of this device
- Checked the Multipod and rigging equipment before each use
- Accept total responsibility for your safety and equipment suitability/configuration.

This device can topple over if the user does not properly account for the direction and the strength of forces occurring in the specific situation and configuration. It is the user's responsibility to read and understand the user manual accompanying this device! However, this manual cannot teach you everything you need to know to use this device safely—TRAINING AND EXPERIENCE IN TECHNICAL RIGGING IS ESSENTIAL FOR SAFE USE!

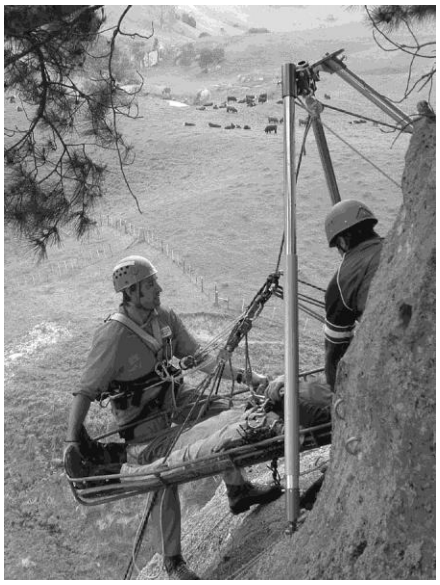
- Do not exceed the safe working load of 600 lbs. (2.7 kN)
- Always maintain a second safety line <u>independent</u> of this device.
- All feet on this device must be securely anchored to resist sideways, spreading and uplift forces.
- Do not couple more than three (3) lower leg sections together on any one leg.
- Check the quick release pins every time you insert them to be sure they are all the way in and the locking balls are fully out and locked!

WHAT is the AZV MULTIPOD?

The AZV Multipod is referred to as a *portable anchoring device* (by the NFPA), or most commonly known as an *artificial high directional (AHD)*. It is used to elevate lines above edges, entries, or obstructions in rescue or work operations and is ideally suited for most edge-mitigation applications including confined space entry, mine, cliff and industrial rescue operations. It is also well suited to bridge and dam inspectors, rope access, the construction trades, military and the movie industry.

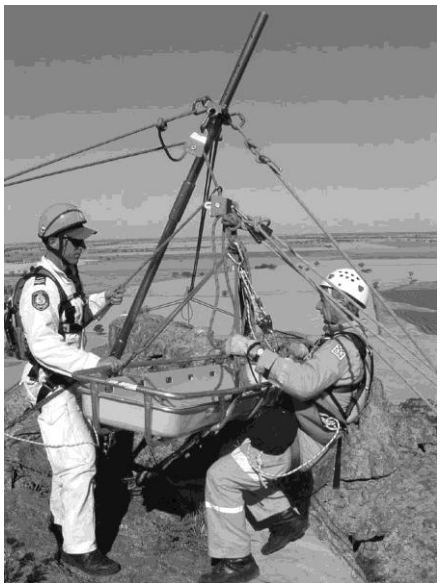
The term "Multipod" is all-encompassing and refers to three possible setups:

1. Tripod (Using three legs. Standard recommended setup)
2. Bipod (Using two legs only. Advanced setup & training required)
3. Monopod (Using one leg only. Advanced setup & training required)



Tripod (without guying)

Bipod (with required guying)



Monopod (with required guying)

Introduction to the AZ VORTEX MULIPOD v.2.0

Congratulations on your purchase of the AZ VORTEX MULTIPOD v.2.0 from Rock Exotica! This beautiful, handcrafted piece of equipment will serve your high directional needs for years to come. You have chosen the most versatile and state of the art high directional available to rescuers and industry today. With proper study and hands-on training, you may use this high directional in a variety of ways and in any number of environments from industry to wilderness.

Reflecting improvements from many Arizona-based Ropes That Rescue Ltd. workshops where the first AZ Vortex (v.1.0) was developed, the new Multipod v.2.0 is the next evolution of the Arizona Vortex. Named the "Multipod" because of its flexibility, the two-piece break-apart head can be rigged as a standard tripod, or in advanced applications as an A-frame, a sideways A-frame[1], or a gin pole. The "easel" leg allows the tripod to be leaned to form an easel A-frame, placing anchor points closer to the cliff or structure edge. With the adjustable leg lengths (combining both the old AZV projecting leg through the head unit and the new telescoping legs), and the flexible third leg, the Multipod lets rescuers set up an artificial high directional in virtually any urban, industrial or wilderness location. The lighter head set and the lighter, shorter legs make the Multipod easier to

[1] Also sometimes known as an "Inline A frame"

transport. On the A-frame and easel A-frame application, at least two pulleys can now be attached directly into the head set without carabiners, eliminating lost headspace and working clearance. Also, the new AZV head sheave can be added as an accessory to totally eliminate the gain of a suspended pulley (important for some confined space or rope access applications). This double pulley feature then makes the Multipod ideal for use with highlines and tracking line offsets as well as those involved in rope access where several lines may be needed over the edge. Depending on surfaces encountered, three different types of feet are available and are sold separately. Inside height clearance in regular tripod configuration: 9 ft. Height with additional legs: 12 ft. System weight: 62 lbs. (28.1 kg)

Improvements to the AZ VORTEX MULIPOD v.2.0

- Multiple feet options: 1) flat Omni foot 2) blunt ball foot 3) standard raptor claw foot
- Standard projecting legs and new telescoping leg option for tighter, restricted confined space and rope access setups
- Indexed lower legs that can be assembled and pinned easily, even in the dark
- Shorter legs (without any loss of tripod height) are easier to transport
- Colored for hot environments; differing color leg sections for ease of identification
- Lighter, smaller head unit milled from solid aluminum
- Pin holes easier to see in contrast to leg color. No hunting
- Can now form two independent artificial high directionals from one unit. Two-piece head set can be separated and then used as a tripod, bipod or monopod (gin pole)
- Pulleys can be pinned into head thus eliminating gain from extra carabiners
- Independent foot bags (purchased separately)
- Reinforced bags with lengthwise zippers for longer wear in harsh environments

Note: The legs on the older AZV “yellow head” do not fit the new version 2.0 head.

The newest version being used in 2004 by Auckland Fire Brigade, New Zealand

STANDARD KIT AZ VORTEX MULIPOD v.2.0

The AZ Vortex Multipod 2.0

The Standard Kit AZV v.2.0 comes complete with:

- Head Set
- Upper Legs
- Lower Legs
- Head Bag
- Leg Bags
- Pin Bag
- Head Pins (1/2")
- Leg Pins (3/8")
- Basic Instruction Manual

Foot options for the AZV v.2.0: (Note: Foot Bags are sold as accessory)

- Raptor (3)
- Blunt (3)
- Omni flat (3)

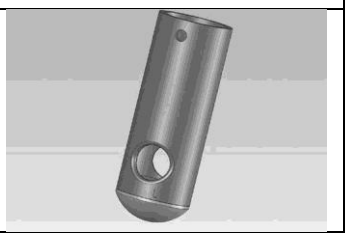
Accessories for the AZV v.2.0:

- Replacement Pin Set (2 head pins and 4 leg pins)
- Upper Leg
- Lower Leg
- Replacement Head Bag
- Replacement Leg Bag
- Replacement Pin Bag
- Foot Bag
- AZV Head Sheave (early 2005)

The AZV Multipod v.2.0 does not come with feet. This allows the end user to purchase the feet that will best suit their set up location. Multiple sets of feet can also be purchased for added versatility. An improved foot design, dubbed the "Raptor" because of its shape, was developed from solid aluminum to help direct downward forces in soft soil like that which would be common in a mine or similar soil-gravel mix locations. Articulating "Omni" flat feet are also provided for industrial environments. The AZV v.2.0 design needed to incorporate a monopod, bipod and tripod capability so that the Multipod could be deemed a multi-function AHD suitable for not only wilderness mountain rescue teams (gin pole or bipod), but industrial teams as well (confined space).

Unlike other metal tripods or unequal-sided tetrahedrons, the AZV adapts to almost ANY terrain or difficult setup location. Also, new products are in development by Rock Exotica for use with the standard kit. These developments can be viewed on the World Wide Web at the AZV web site:
http://www.ropesthatrescue.com/azvortex.htm

AZ VORTEX MULIPOD v.2.0 FEET OPTIONS

1. OMNI FOOT • Useful in situations where an articulating foot is needed. • Solid aluminum with glued rubber sole for extra grip ability • Bolt holes • Carabiner holes. • Useful with gin poles	
2. RAPTOR CLAW • Useful in soil, rock or surface where a sharp point is needed. • Chain slot used with securing foot to surface • Carabiner hole at bottom • Hardened steel tip which is able to be replaced • Rigging ears	
3. BLUNT FOOT • Useful with gin poles • Useful in varying situations where the Omni Foot or the Raptor Foot will not be desirable	

We will address the anchoring issues on various substrates:

- SLIPPERY SURFACE— Recommended: AZV Omni Foot. An example of a slippery surface might be a concrete or asphalt roadway, ice, metal surface, etc. In these cases the AZV is best anchored down by using proper rigging and attaching each AZV Omni Foot to the adjacent Omni Foot. In this case, the force on each leg of the tripod should be compression only. If one or more of the legs comes under tension, the tripod can topple.
- SOFT SOIL—*UNDISTURBED*— Recommended: AZV Raptor Claw. The Raptor Claws of the AZV are designed to slide down into this type of substrate with minimal outward force on the A frame legs. Use the heel of your boot on each Raptor claw to firmly press the foot into the soil. All legs must still be anchored to each other or to independent anchors. Use rigging, chain or other anchoring means not supplied with the standard AZV kit.
- SOFT SOIL—*DISTURBED*— Recommended: AZV Raptor Claw. A disturbed soil condition, like in an open pit mine, requires additional soil pickets (not supplied) for anchoring the AZV. The Raptor Claw on each leg is placed up against the driven picket so that force on the AZV forces the Claw down, not out. Use the Chain or anchoring means and lash the Raptor to the pickets.
- INDUSTRIAL GRATING— Recommended: AZV Omni Foot, Raptor Claw or Bunt Foot (depending on conditions). Depending on what type of grating is found, use the desired foot with the AZV. Tie all feet to the grating IF the grating is secure.
- ROOFING— Recommended: AZV Omni Foot. In conditions where the roof surface cannot be marred or punctured by the Raptor's point, use the Omni Foot option with the AZV on each leg. The Flat Feet provide protection to the roofing, but allow a skidding action with the AZV legs. Anchor each leg to the others or down to the roof structure or parapet.
- ROCK—*UNFRACTURED*— Recommended: AZV Raptor Claw. In unfractured sandstone, limestone or igneous rock use the OPTIONAL short rock/soil chains looped through the Raptor Claw chain slots. Bolt each side of the chain down using 3/8 diameter stud-type of raw anchors
- ROCK—*FRACTURED*— Recommended: AZV Raptor Claw. Without placing bolts, use standard rock protection hardware to anchor the feet of the AZV. After placing the pro, lash the feet tightly to these anchors.

ASSEMBLY of the AZ VORTEX MULIPOD v.2.0

Here, the user can identify all the various features and parts to the version 2.0 AZV which will, in turn, lead to more productive and certainly safer use of the device. As a true “Multipod”, remember that the orientation on this high directional in all its forms including tripod, bipod and monopod may require additional outside training from a competent rope school familiar with and qualified to teach the use of this product. It is the user’s responsibility to get the required training and to understand the principles of the “artificial” high directionals (AHD).

It is strongly recommended that the user always inspect the AZV for any damage, loose parts or other abnormalities before and after each use. Small metal burs in between parts that fit together may be removed with a small metal file prior to assembly.

It takes at least two people to assemble the AZV. More than this, at least initially, is strongly advised. Installing the AZV at ANY edge without handrails or fall restraint requires the use of fall protection for personnel within the “Hazard Zone” (2m or 6’ away from a fall hazard or edge). Many people elect to use personal travel restrict at the edge to prevent a fall.

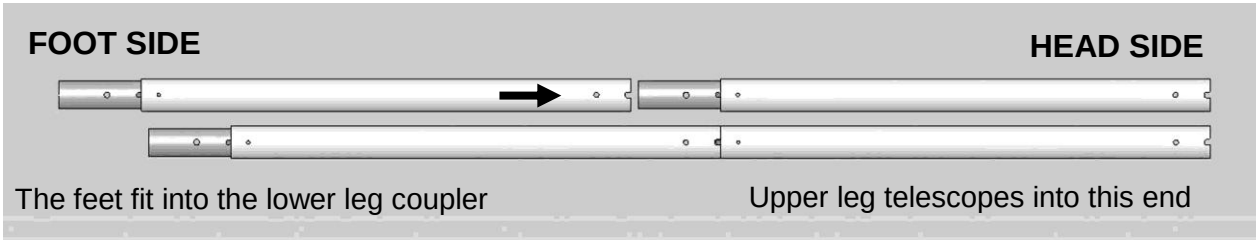
Students in Wharepapa, New Zealand learn assembly of the AZV under controlled environment before heading to the cliff (in background)

It is a good idea to first assemble the AZV in a controlled environment where team members can move around and watch how the AZV goes together without worry of falls or other hazardous situations common to the edge. A large grassy area is ideal. Look for small garden walls or low planters where the team may go through the motions of setting the AZV up. After a few dry runs, it is suggested that you add the element of harnesses, helmets, fall restraints and the full anchor system found described in a later section. Still this should only be done near the ground in a safe location before heading to more exposed locations on the cliff or structure.

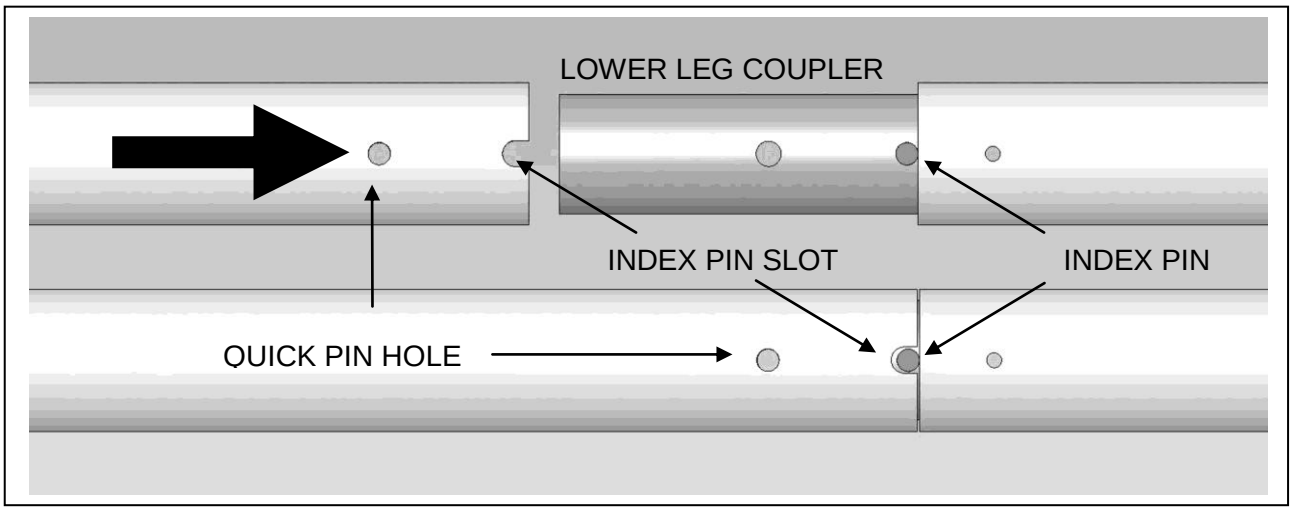
ASSEMBLY (Cont.)

LOWER LEG ASSEMBLY

There are two different legs for the AZV. The lower legs are slightly longer and have a two-tone finish on them. The outer surface is powder coated and the inner coupler is anodized (for a closer tolerance). Lower legs easily fit together by inserting end to end as shown. The design of the AZV lower legs allows for the legs to be fit together even in dark situations. This is because of the



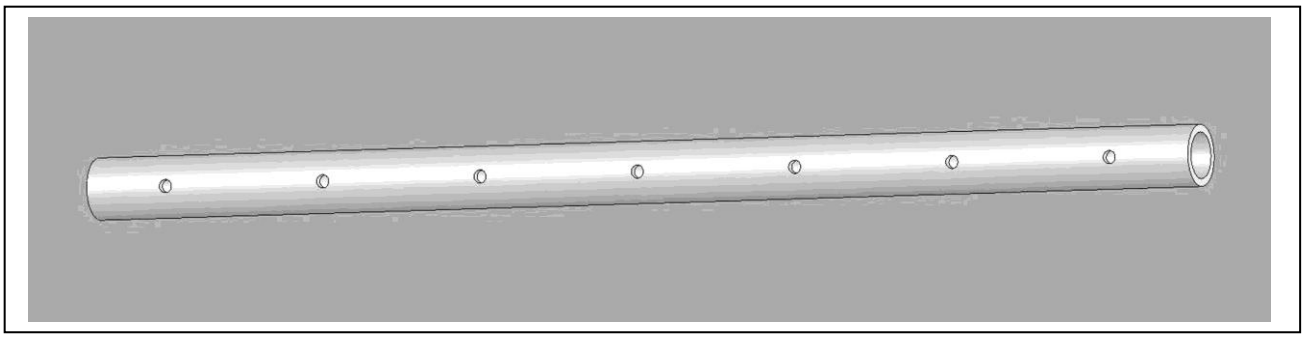
small index pin and index pin slot (shown below) which keeps the user from having to hunt for the quick pin hole. Line up the index pin on each leg at the coupling and then insert a quick pin. Be mindful of inserting the pins head in such a way as to not create a snag for the ropes running to and from the AZV. Inserting the head away from the rope path will reduce this possibility. The lower leg will always have the lower leg coupler at the bottom and this coupler is what one of the three AZV feet will fit into.



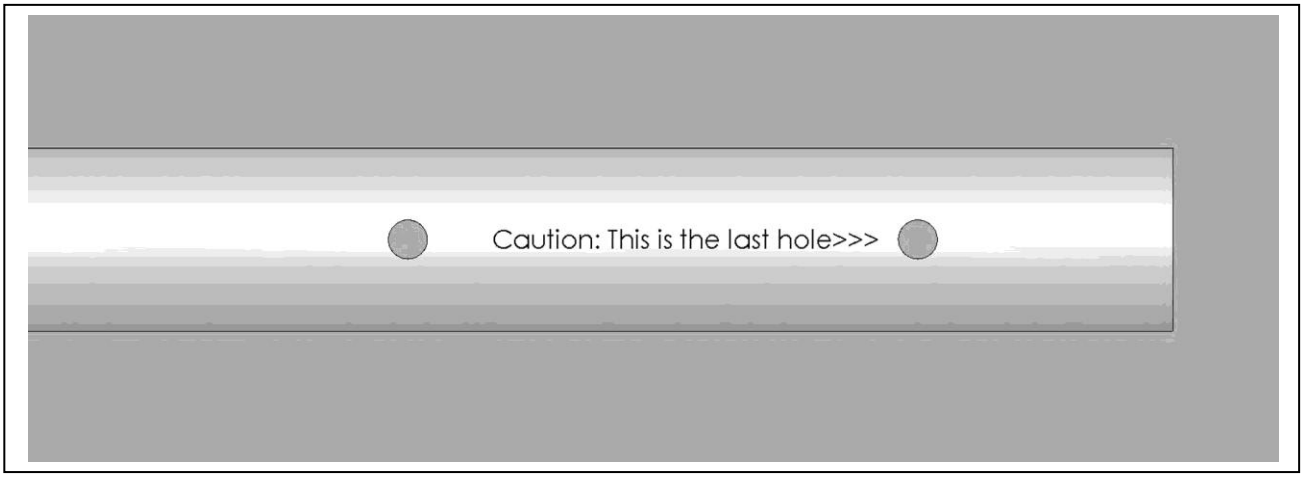
ASSEMBLY (Cont.)

UPPER LEG ASSEMBLY

There are three shorter upper legs for each of the three receptacles on the AZV head: 2 on the A frame joiner and 1 on the gin pole. The upper legs are entirely anodized instead of powder coated like the bottom legs so they are easily distinguished. Also, they have quick pin holes at 6" intervals along their entire length. This allows the upper legs to be pinned at these intervals for rapid leg adjustment relative the terrain or surface encountered. Additionally, the A frame joiner has two holes, one on top of the other, that allow adjustment in smaller increments if that is needed.

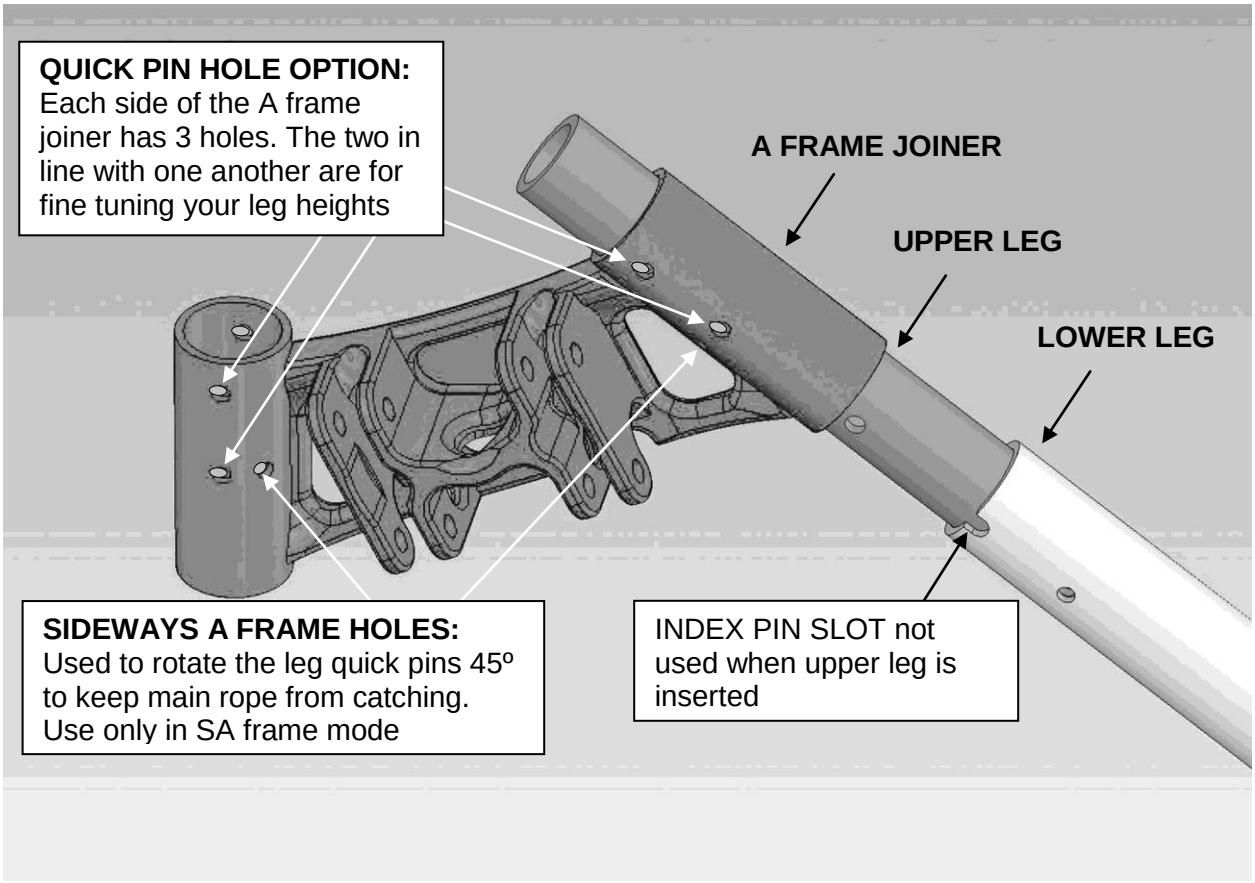


On each upper leg at each of the two ends, there is a WARNING which reads: "CAUTION: THIS IS THE LAST HOLE". This is your indicator that you have no more extension on the upper leg. If you see this warning, the leg cannot be extended farther out of the hole. This may mean that you should add another lower leg and then reevaluate the desired length with it in place.



ASSEMBLY (Cont.)

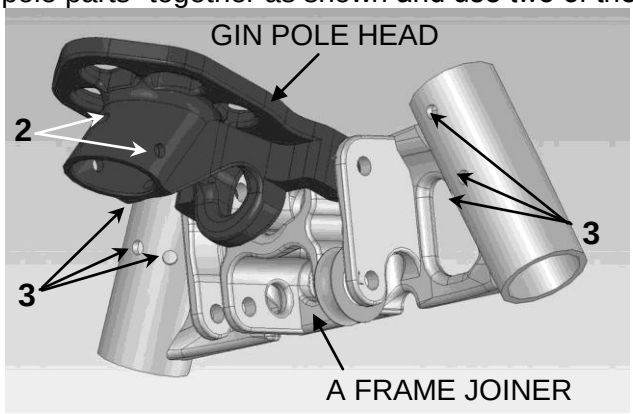
LEG ASSEMBLY and INSTALLING LEG INTO HEAD

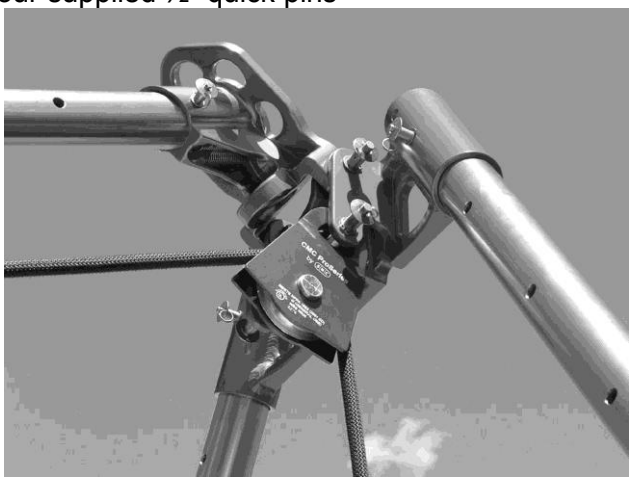

QUICK PIN HOLE OPTION:
Each side of the A frame joiner has 3 holes. The two in line with one another are for fine tuning your leg heights
A FRAME JOINER
UPPER LEG
LOWER LEG
SIDEWAYS A FRAME HOLES:
Used to rotate the leg quick pins 45º to keep main rope from catching. Use only in SA frame mode
INDEX PIN SLOT not used when upper leg is inserted

ASSEMBLY (Cont.)

LEG ASSEMBLY and INSTALLING LEG INTO HEAD

To assemble the two piece head assembly, easily slide the blue A frame joiner and orange gin pole parts[2] together as shown and use two of the four supplied ½" quick pins





To install the legs, simply insert the upper leg into the bottom of each of the leg receptacles. You have several choices as to which quick pin hole you use depending on which high directional you are intending to build.

- **A FRAME JOINER:** With the A frame joiner, there are three (3) holes per side (total of six) which allows the user total flexibility in choosing the best leg arrangement depending on which high directional they are building. In looking at each end of the A frame joiner, you can see that there are two holes in line and one hole off to the side at a 45º angle to the other two. These two holes are for adjusting the height of the head relative uneven ground in smaller increments than are allowed with the upper legs which have holes 6 inches apart. So, by using either of the holes, you can adjust the height of the head in smaller increments. The third hole is used only for times when the user is building an SA frame. By using these holes on each side of the A frame joiner, the quick pins on the legs below are rotated 45º (this should make no difference to the feet) and will keep the main line rope from catching on the pins inadvertently.

- **GIN POLE:** With the gin pole leg, you have two (2) holes to choose from (see above left). Use the hole that will keep the main line rope from catching on any quick pin as the system is loaded during your operation. Again, this will vary from one high directional to another.

Above, the gin pole leg quick pins (see arrow) are turned so that the rope will not catch.

[2] These two parts may be reversed

ASSEMBLY AT THE EDGE

There are two (2) ways to assemble the AZV:

1) Partially build it in place (some parts must be preassembled) and
2) Entirely build it away from the edge and move it forward to the edge in one piece.

Both require some practice and both have advantages and disadvantages. Practicing both will give the team the best option under difficult setup situations.

Regardless of which way you go for assembly, ALWAYS attach a tether cord to the pieces or entire unit until it can be securely anchored down at each foot (below left). This tether cord should be monitored (belayed) on a separate anchor by a person to the rear to prevent the AZV from toppling over during installation and tie down. (You might leave the tether in place during the operation for later disassembly) Do not have a person belay the AZV to the edge from a position where they are in the “belay chain” (where they are in series with the belay system). If a fall at the edge occurs, the AZV and belayer can both be pulled over the edge. Do not leave an unsecured AZV unattended without having been securely anchored! Holding the AZV in place until you are sure it is secure (below right) is always a good idea. It is also suggested that one person (who is able to see the whole set up back from the edge) be in charge of the setup and that communication is deliberate and precise.

1. ASSEMBLY IN PIECES:

In a difficult mountainous or industrial location, the AZV may need to be assembled at the edge in pieces. The method of doing this is to have two people on travel restricts hold the A frame portion of the AZV at the desired location. This A frame should be belayed as described previously. Then a third and perhaps fourth person should bring out the final easel leg and make the connection on the balanced A frame. At this time, adjustments may be made to the legs by those closest to the pins. Once the feet are secured, the tether may be slacked off or removed. However most people leave the tether in place for later removal.

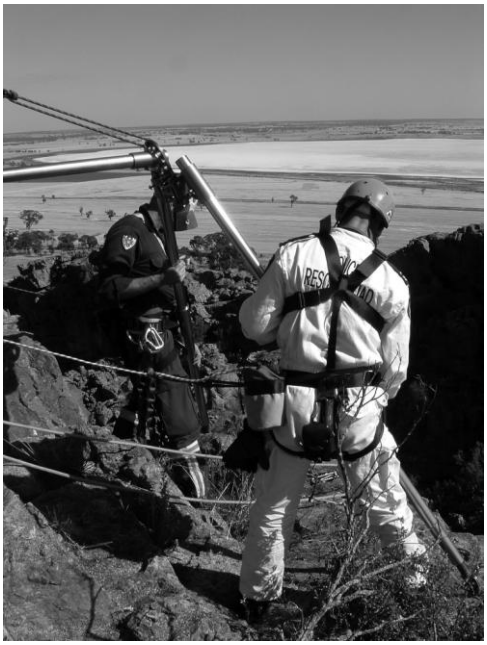
Top left: Rescuer at Mt. Arapiles, Victoria, Australia assembling easel leg into head assembly while personnel manually hold front legs at edge (bottom right). All personnel are on travel restrict devices and all key components of the AZV have a tether cord attached. Photo from 2003 RTR collection.

ASSEMBLY AT THE EDGE (Cont.)

2. ASSEMBLY AS ONE UNIT AND CARRIED INTO POSITION:

A second alternate way to install the AZV at the edge is to build it completely first well away from the edge, and then walk it out as one piece to the edge. This may require three to four people and is more difficult to build to mirror rough terrain. Sometimes combinations of both techniques works well but remember that it is difficult to change pins at the head while standing on the brink of a large drop. Make these changes back from the edge and then move the AZV into position and tie down the feet only after making your final changes. Several attempts at getting it right may be needed before tie down commences. With more and more experience under your belt, this process will become less cumbersome with time.

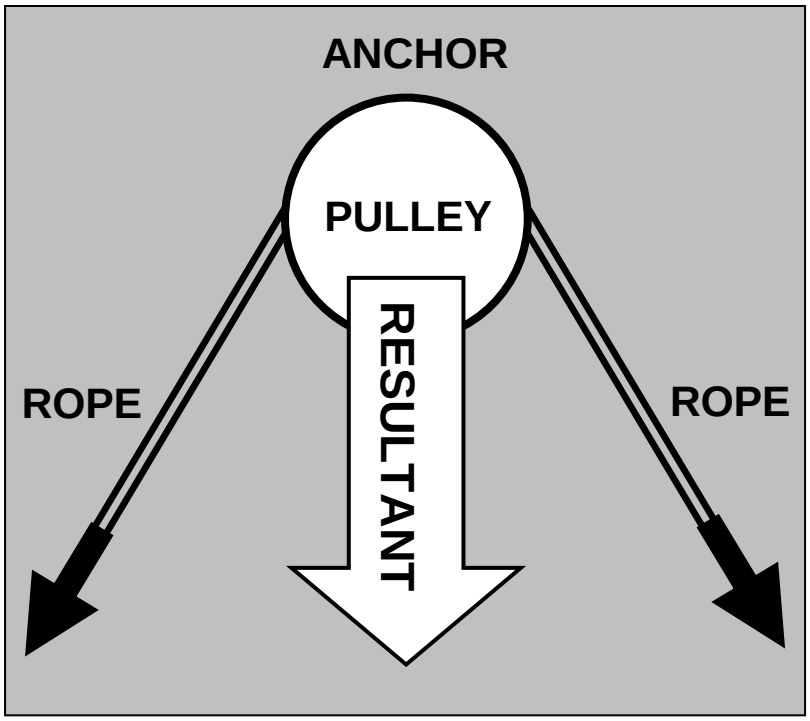
It is difficult for all three people holding a respective leg to know what the other wants. For instance, if the left front leg is moved, say, three inches forward into a seemingly “perfect” pocket, it produces a rotation of the back leg of about five inches. In any case, do not force the legs into position if they do not want to go. Tension on legs before the operation begins can result in damage to the unit and bending a component. The AZV should be “relaxed” while it is being tied down. Practice setting the AZV up with full gear, travel restricts and tether near a benign edge first before going to height.



Above, rescuers at Mt. Arapiles, Victoria, Australia with independent travel restrict devices approach the edge with a fully assembled AZV. The entire AZV has a tether cord attached.
Photo from 2003 RTR collection.

Disassembly of the AZV is less problematic. Simply get enough personnel on travel restrict devices to remove the anchoring at each foot and, upon hearing the word from the person in charge of tear down, carry the entire device back out of the hazard zone for disassembly. Again, the tether cord should be in place on a separate anchor during this movement back from the edge. Once the AZV is back from the edge and well away from any hazard, it may be taken apart, inspected for any damage, and stowed in its proper storage compartments.

PRINCIPLES OF OPERATION



Stability is always a concern when using tripods, bipods and monopods. Unless the forces are carefully evaluated, the possibility of legs slipping or the structure toppling is very real. The following Principles of Operation apply to using the Multipod as well as other tripods, A-frames, and gin poles.

Every time a system rope runs through a pulley, each side (of the rope) has force applied to it. The force should be roughly equal on each side of the pulley. Each of those equal are called "component" forces (really, components of a "sum"). These component forces will add together to create a "resultant force" which will bisect the angle from these ropes. While the resultant force is invisible, it is important that the user of the AZV understand where this invisible resultant is pointing in order to prevent a catastrophic topple. It is with this in mind that the following points are made:

- THREE LEGS IS BEST: Whenever possible, set up the AZV Multipod in the three-legged configuration. It usually takes less effort to transport the complete set of legs than to securely rig the AZV in the A frame, SA frame or gin pole configuration. These bipod and monopod options should be used where the full tripod configuration cannot be adapted to the location.
- EQUAL-SIDED TRIPODS: The resultant force on any equal sided AZV tripod should be directly down, as close to the center of the three legs as possible. If this resultant force points to a location on the ground outside the "footprint" of the three legs, the tripod can topple violently. Many times this will result in needed a bottom anchored pulley[3] to direct the resultant force directly downward.

Resultant force between legs MANDATORY

[3] Called a "butt block" because it is at the butt of the high directional

PRINCIPLES OF OPERATION (Cont.)

- EASEL A FRAMES (EA Frames): When extending the easel leg of the AZV Multipod (also known as an easel A frame or EA frame), the resultant force vector should still be pointed as close as possible to the center of the three legs, wherever they may be placed. An additional tether under tension may be needed to secure the AZV.

- A FRAMES: The resultant force on an A frame should be either in line or slightly in front of the legs (called “erroring forward”). The problem exists where the tensioned main line through the AZV (indicating the *actual* components and resultant) does not exist when the A frame is being guyed down. Many times it is too late to readjust this A frame after the system comes under load. So erroring forward slightly onto the tensioning guying system to the rear is considered an acceptable practice to remedy the situation. Also, the forward guys on an A frame are many times over the edge and cannot be easily checked for viability. Erroring forward will take the force off these front anchors when the system comes under load.

- SIDEWAYS A FRAMES: The resultant force on an SA frame should roughly in between the two legs. It is recommending that the SA frame be used with highlines and offsets where the rope going over the edge is changing angle inward and outward, depending on tension. This continues to change the front rope component force, thus also changing the resultant force vector. EA and SA frames are well suited for this. A frames and gin poles are not.

- ANCHORING THE FEET: Prevent any possible movement of the legs by connecting the feet together with rope, webbing, or chain or by anchoring each individual foot to the surface.

- Consider using the easel leg to the side when setting up sideways A-frame. If the Working Line is kept inside the legs, stability is increased. The easel leg should still be guyed back.

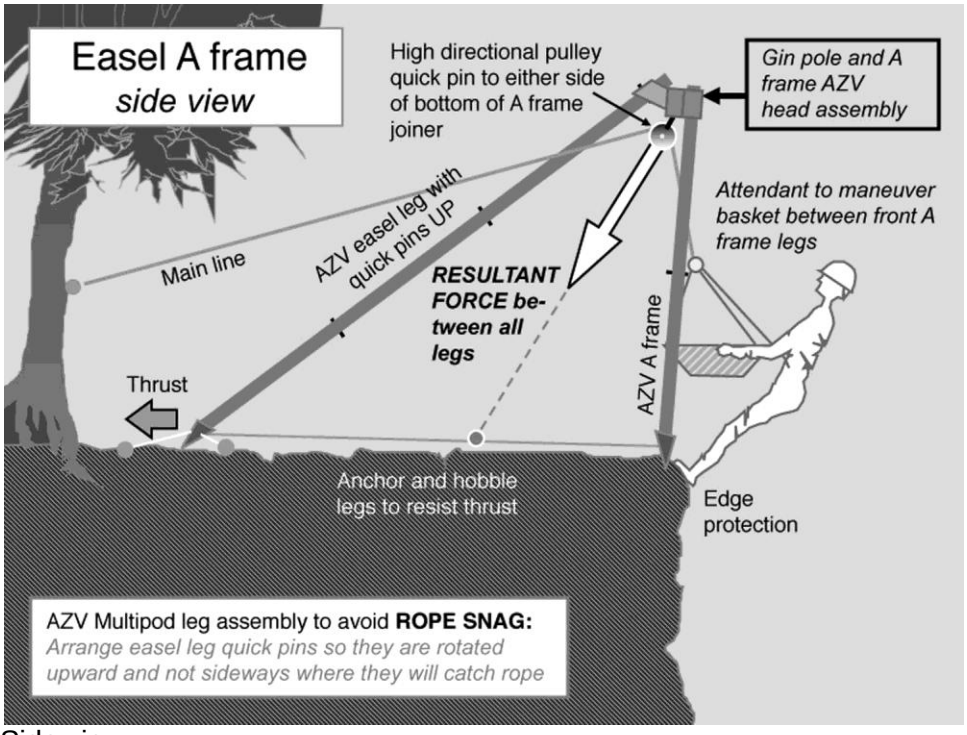
- 8 or 9 mm Accessory Cord works well for Guy Lines and Tether Cords in most circumstances. Use the triangular holes in the head for attaching Guy Lines.

- Always run the Safety Line (Belay Line) at ground level. This minimizes the possible fall distance if the AHD topples or collapses.

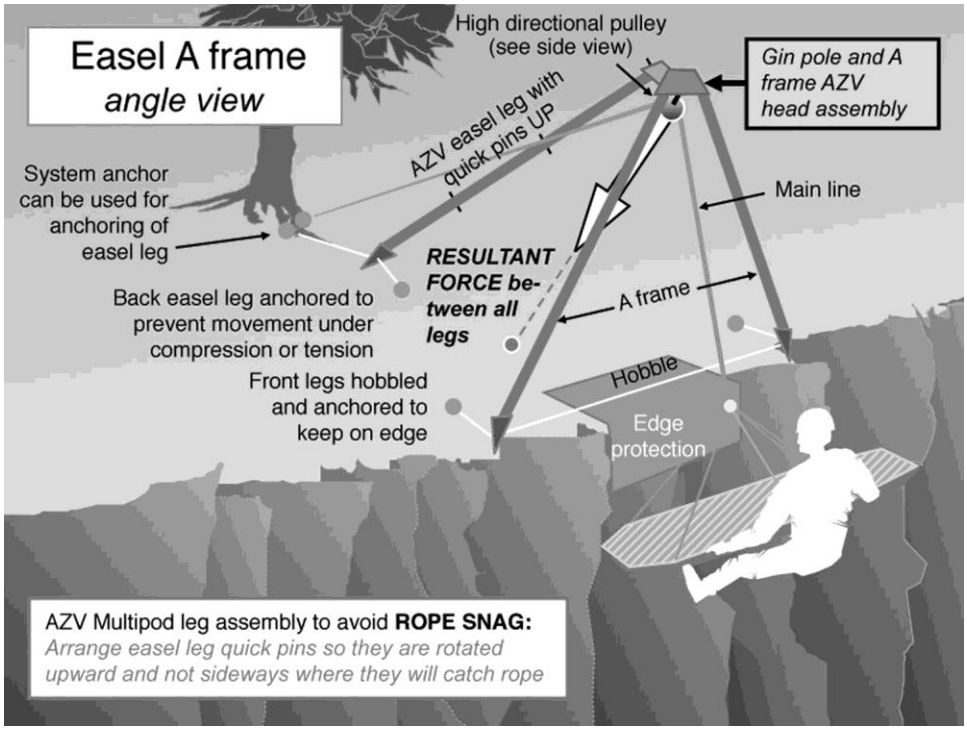
- Always provide travel restraint for personnel working near the edge.

PRINCIPLES OF OPERATION (Cont.)

AT THE EDGE SETUP OF THE AZV MULTIPOD


Easel A frame
side view
High directional pulley quick pin to either side of bottom of A frame joiner
Gin pole and A frame AZV head assembly
Attendant to maneuver basket between front A frame legs
Main line
AZV easel leg with quick pins UP
RESULTANT FORCE be-tween all legs
AZV A frame
Thrust
Anchor and hobble legs to resist thrust
Edge protection
AZV Multipod leg assembly to avoid ROPE SNAG:
Arrange easel leg quick pins so they are rotated upward and not sideways where they will catch rope

Side view

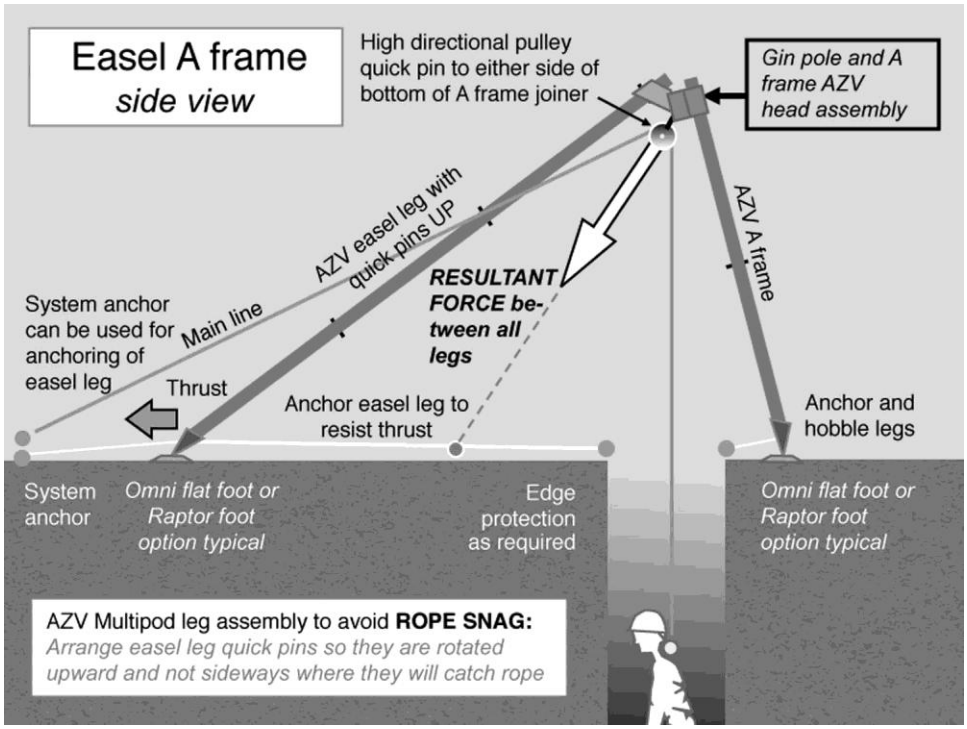

Easel A frame
angle view
High directional pulley (see side view)
Gin pole and A frame AZV head assembly
AZV easel leg with quick pins UP
System anchor can be used for anchoring of easel leg
Main line
RESULTANT FORCE be-tween all legs
Back easel leg anchored to prevent movement under compression or tension
A frame
Front legs hobbled and anchored to keep on edge
Hobble
Edge protection
AZV Multipod leg assembly to avoid ROPE SNAG:
Arrange easel leg quick pins so they are rotated upward and not sideways where they will catch rope

Isometric view

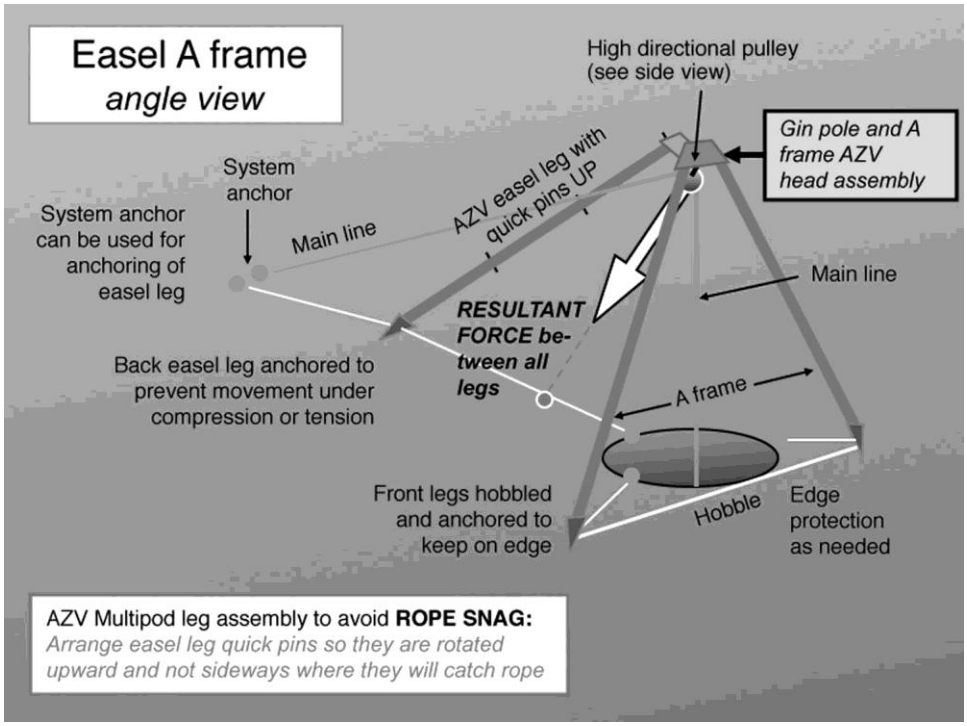
At the edge setup of the Multipod is perhaps the most common. This allows the negotiation of a heavy rescue package up and over both the edge of a building or structure and the wilderness cliff edge. The Multipod must be anchored as shown as the resultant force still wants to push the entire tripod away from the edge. Also, the resultant must remain well within the footprint of the three legs.

PRINCIPLES OF OPERATION (Cont.)

OVER A MANHOLE SETUP OF THE AZV MULTIPOD


Easel A frame
side view
High directional pulley quick pin to either side of bottom of A frame joiner
Gin pole and A frame AZV head assembly
AZV easel leg with quick pins UP
AZV A frame
RESULTANT FORCE between all legs
System anchor can be used for anchoring of easel leg
Main line
Thrust
Anchor easel leg to resist thrust
Anchor and hobble legs
System anchor
Omni flat foot or Raptor foot option typical
Edge protection as required
Omni flat foot or Raptor foot option typical
AZV Multipod leg assembly to avoid ROPE SNAG:
Arrange easel leg quick pins so they are rotated upward and not sideways where they will catch rope

Side view

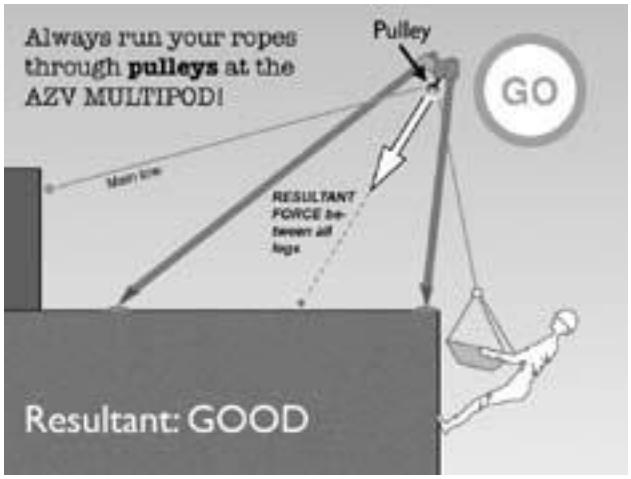

Easel A frame
angle view
High directional pulley (see side view)
Gin pole and A frame AZV head assembly
System anchor
System anchor can be used for anchoring of easel leg
Main line
AZV easel leg with quick pins UP
Main line
RESULTANT FORCE between all legs
Back easel leg anchored to prevent movement under compression or tension
A frame
Front legs hobbled and anchored to keep on edge
Hobble
Edge protection as needed
AZV Multipod leg assembly to avoid ROPE SNAG:
Arrange easel leg quick pins so they are rotated upward and not sideways where they will catch rope

Isometric view

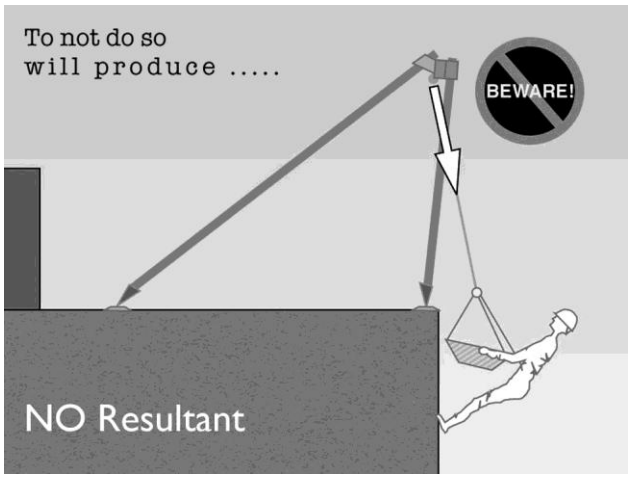
The Multipod can also be used over a confined space opening like a manhole. Again, the feet need to be anchored to the surface and the entire tripod must be anchored to resist the thrust caused by the resultant as shown in the side view. Remember also to position the easel leg so that the quick connection pins are facing upward (and not to the side) so that the rope going to the high directional pulley will not catch accidentally and lift the easel leg catastrophically.

PRINCIPLES OF OPERATION (Cont.)

ATTACHING TO THE HEAD OF THE MULTIPOD



1



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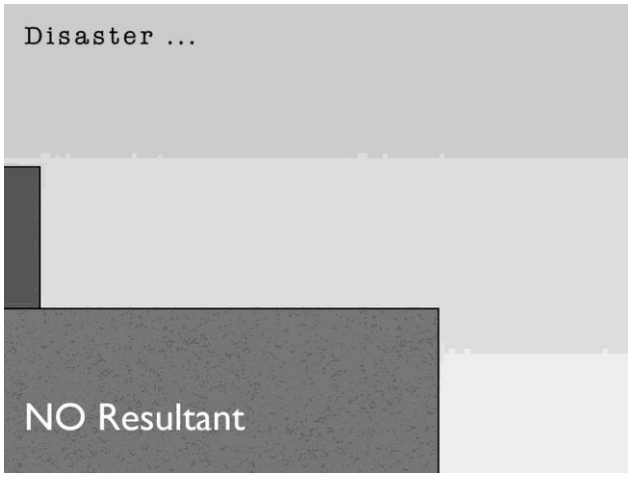


3

SYSTEM ROPES:
It is important to configure all system ropes (NOT including the system belay rope) in pulleys before attaching them to the Multipod head (See #1). This produces a resultant force which can then be directed between the legs of the Multipod (called the footprint). In all cases, the resultant should point to a location on the ground that is well within the footprint of the three legs. If there is any doubt as to whether this will occur, the addition of guys to the tripod may be required.
In the bottom two illustrations, you can see that a load is attached to the head without a pulley. This produces a very hazardous condition which can catastrophically topple the Multipod over the edge.

EDGEMEN:
When edge men are present at the Multipod to assist the rescue package, they may attach directly to the Multipod head only if the main attachment is back as shown in illustration #1. After this, the travel restrict system rope may be clipped through a carabiner at the Multipod head. By doing this, this rope will again produce a resultant on the high directional which will not pull the device over the edge if the edge person falls.

ANCHORING of the AZ VORTEX v.2.0 MUTIPOD

With the several style feet sold separately from the standard AZV kit, you must be familiar with type of feet you need for the setup location you are attempting. All feet of the AZV, regardless of type, must be anchored to prevent downward, sideways, spreading and uplift forces (in some cases). Without the collective or independent anchoring of each leg, the AZV can catastrophically collapse during the operation!

UNANTICIPATED MOVEMENT OF THE AZV UNDER A DYNAMIC EVENT:

It is important to remember that the AZV must be secured for any possible unanticipated dynamic event. To do this, the rear easel leg must be secured for compression and tension. This means that the easel leg should not be able to move forward towards the edge nor backwards, away from it. The easiest way to accomplish this is the anchor the rear foot to the substrate. Anchoring this rear foot can be tricky on rooftops and other slippery surfaces, but in wilderness locations, it is easily accomplished with rigging savvy and know how. 1" tubular webbing is the tool of choice since it can be easily lashed tightly to rock outcroppings, rock protection, bolts and the like. Rigging formed as a Spanish windlass can tightly capture and secure the foot regardless of type.

If the surface does not allow the securing of the back easel leg foot to the surface, an alternate method must be employed for keeping the head, and hence AZV, from being pulled over the cliff edge in a dynamic event. This uses a combination of securing the foot from compressive forces (by tying low up to the edge), and securing the HEAD, not foot, to the rear for tensile forces. This tensioning element can be incorporated into the Tether Cord already discussed earlier. Both can be one and the same, however the significance of the anchor may need to be improved for the later use. What this accomplishes is keeping the easel leg foot from movement back and the AZV head from movement forward by two separate independent systems. Hence compressive and tensile forces are thereby taken care of by a simple yet effective means. In any case, the AZV should be secure before the operation begins.

Above, a rescuer ties the left front foot of a Raptor Claw foot down using several pieces of rock climbing protection. Also, the two front A frame legs are "hobbled" together to prevent leg spread during the loading of the AZV. Notice also the tether cord in place and holding the AZV head from outward movement in a dynamic event. Photo from 2003 RTR collection.

ANCHORING AND HOBBLING the AZV FEET (Cont.)

Independent or hobble anchoring the feet of the AZV is required. Independent anchoring is just that: each foot is secured for movement by itself. With hobble anchoring of the feet, two or maybe three are tied together. Every situation is different and no amount of information presented in this manual can prepare the user for all circumstances in the field.

INDEPENDENT ANCHORING THE FEET

If at all possible, the feet should be secured from movement in any direction: down, up or sideways. This means that if a common compression force is applied, the foot will not dig in and move significantly. Small amounts of movement (< 1/2") are acceptable and are referred to as

AZV independent anchoring of front A frame feet at difficult location in mountains. Notice raptor claw on edge of pointed rock with tensioning systems in opposition to hold in place.

"settling in" of the feet when the operation begins. Also, if the AZV moves in an unanticipated direction, there may be a lifting, or tensile force, on the foot. So, a way should be sought to keep the foot down. There are multiple ways to accomplish this with the varying substrates found. For instance, in rock, rock pro or bolts may be placed to hold the foot. On industrial grating, the foot can be lashed down tightly.

ANCHORING AND HOBBLING the AZV FEET (Cont.)

HOBBLING THE FEET

If you cannot independently anchor each of the feet (which may be the most desirable) then alternate methods must be taken. The front A frame portion of the AZV must be secured, or "hobbled", from spreading action. The A frame legs are those that insert into the BLUE portion of the head. The easel leg is that which inserts into the ORANGE part of the head (Note: In older versions of the AZV Before Oct. 18, 2004 and where the serial number is less than #2083, these colors are reversed) To accomplish this, use webbing or cordalette (small accessory cordage) between the bottom-most holes on the feet (to avoid a tripping hazard). Form a small mechanical advantage or similar "truckers hitch" to apply moderate tension in between the A frame legs Do not apply too much tension as well as this may bend the legs where they enter the head assembly of the AZV. Snug is just right. Also, the edge padding or protection for the ropes moving over the edge can be attached to this hobbling rigging if desired.

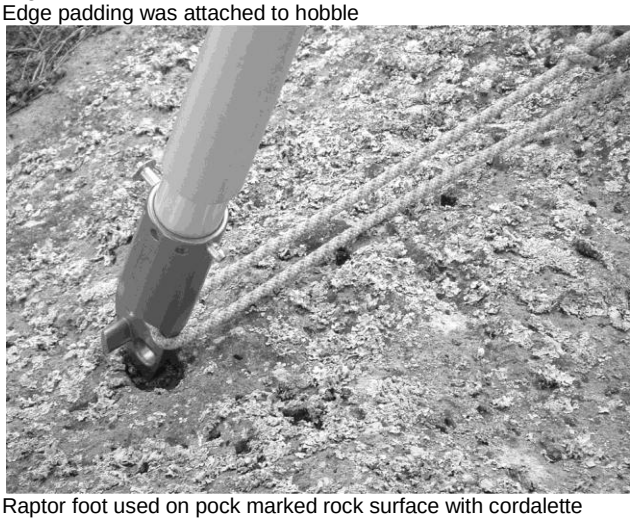
In the below photograph taken of the AZV during a mountain rescue operation, you can see that the team has implemented a soft hobble. In other words, they have a small 3:1 mechanical advantage built and in place, but you can see it is not drawn up as tight as possible (see slight sag in hobble). This allows some adjustment later if something moves around when under load. If this were replaced with a single piece of material, this adjustment after the fact is not possible.

Many times, a hobble will be in the way of the evacuation path. In these cases, independent anchoring of each leg is needed requiring more sophisticated anchoring methodology

AZV RAPTOR FOOT ANCHORING

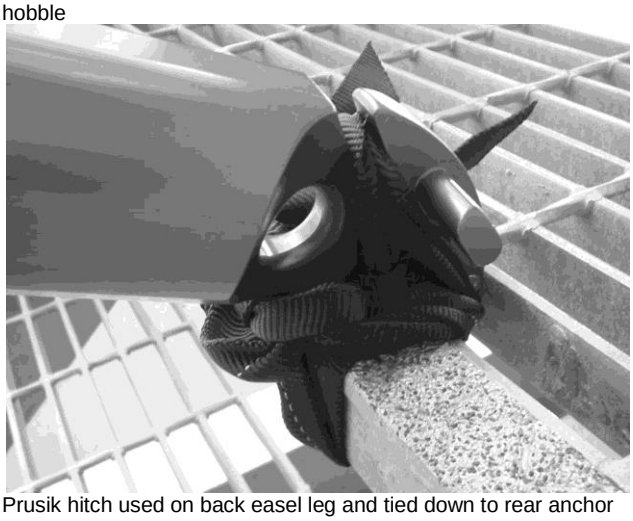
Raptor foot being used on concrete edge with a webbing hobble and a secondary tie back to keep the foot from jumping over the edge
Edge padding was attached to hobble

Raptor foot used on plate metal with webbing hobble and tight webbing lash back to anchor on left

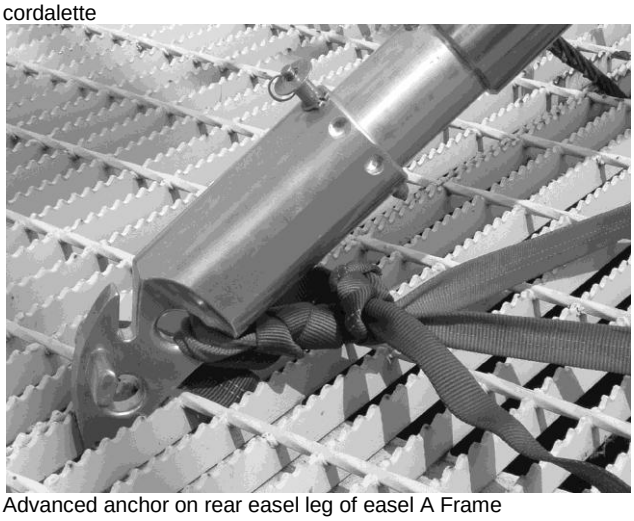


Raptor foot used on pock marked rock surface with cordalette hobble

Raptor foot used on concrete parapet with cross lashing using cordalette



Prusik hitch used on back easel leg and tied down to rear anchor to prevent uplift

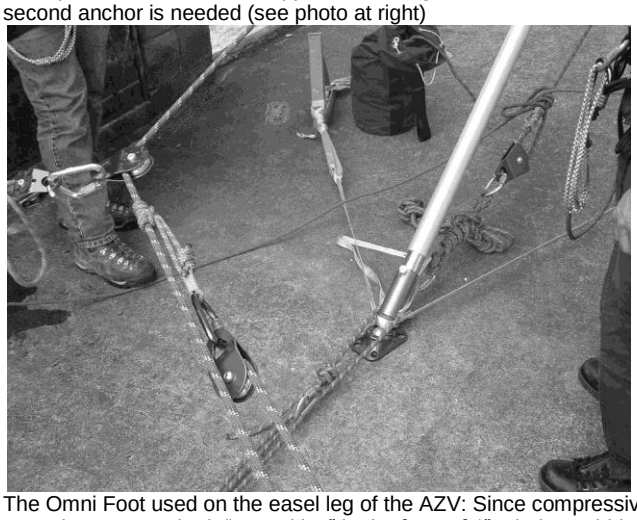


Advanced anchor on rear easel leg of easel A Frame

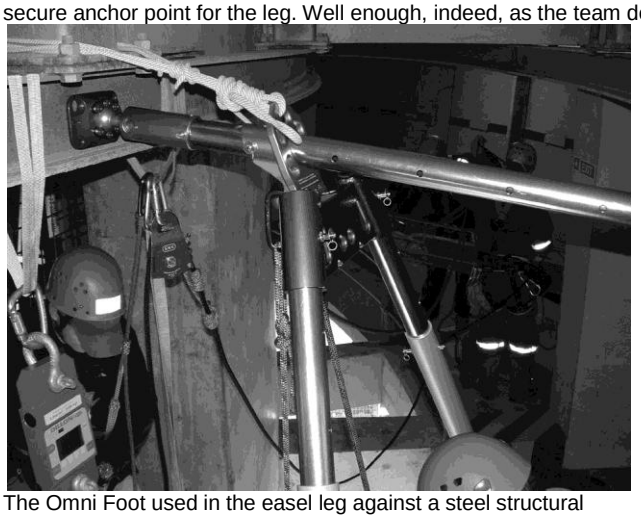
AZV OMNI FOOT ANCHORING

The Omni Foot secured independently with a single webbing anchorage. Remember that at times the anchorage cannot be exactly in line with the force applied to the leg. If this is the case, a second anchor is needed (see photo at right)

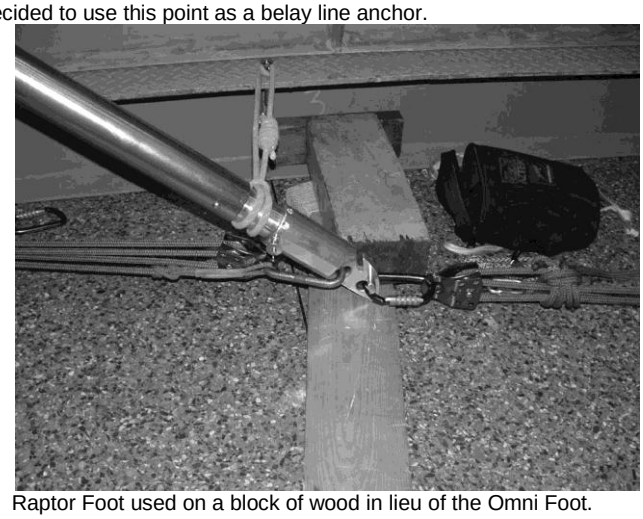
The Omni Foot secured independently with two opposite webbing anchorages.



The Omni Foot used on the easel leg of the AZV: Since compressive and tensile forces must be anticipated on this slick surface, the users have set up both “opposition” in the form of 1” tubular webbing with a pre-tensioned back tie our of 7/16” (11.1mm) to firmly secure the foot in place. While the foot could still be lifted inches off the surface if the easel leg came under tension, it still provided a secure anchor point for the leg. Well enough, indeed, as the team decided to use this point as a belay line anchor.

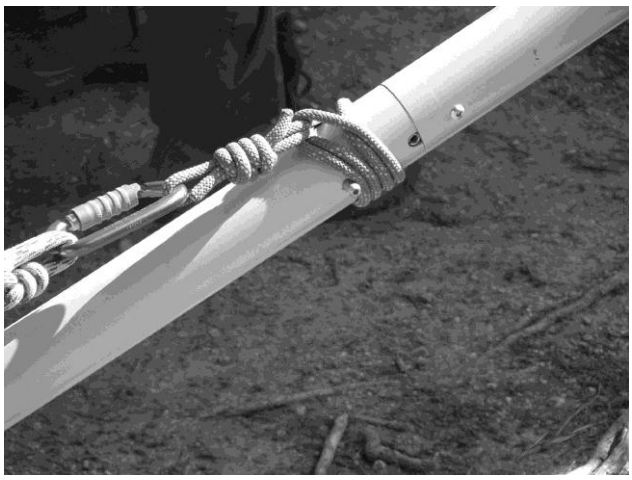


The Omni Foot used in the easel leg against a steel structural beam and held by a tightened cordalette anchorage



Raptor Foot used on a block of wood in lieu of the Omni Foot. Here, the foot is secured on a slippery terrazzo floor by using two mechanical advantages working in opposition.

ALTERNATE METHODS OF AZV FOOT ANCHORING



ALTERNATE METHODS OF ANCHORING:

Anchoring of the AZV easel leg where limited anchorages exist. At left, the leg is held down into the substrate to a low anchor by a cordalette tensioning system. Above, a double wrap prusik is used around the easel leg just above the quick pin so that it cannot slide down

A separate opposition anchor attached to the Raptor Foot at ground level is applied towards the cliff edge. In combination, as shown, this becomes an acceptable alternative to other complex rigging. Both compressive and tensile forces are resisted by such an anchoring method where opposition and tensioning systems are used in combination.

ALTERNATE METHODS OF ANCHORING:

While the Raptor Foot placed in a solid rock pocket is seemingly without anchorage, it has been secured by alternate means not visible in the photo. The pocket itself is not enough to resist upward forces on the leg so a tensioning system had been added to the center of the AZV to pull down on all the legs equally. Notice the anchor is rigged for upward force that this tensioning system applies.

ADVANCE APPLICATIONS

Everyone knows that something with three legs is inherently stable compared to something with two, or even one leg. The same principle applies to tripods, bipods and monopods. The AZ Vortex v.2.0 is the first manufactured artificial high directional to employ technology allowing the user to use all three if the situation warrants. Many times in wilderness and industrial locations where a portable elevated anchoring device is needed at a particular location, a tripod with a large "footprint" will be untenable. Consequently, a bipod (which is stable in one direction) or a monopod, or "gin pole" (which is not stable in any direction in and of itself) might be an application that the team should examine.

The ADVANCED APPLICATIONS of the AZV User Manual is meant to offer a means of helping the practitioner–whether rescue technician or rope access qualified worker–with the *understanding* behind these advanced applications. It is also meant to be used in conjunction with, but not to supplant, hands-on training provided by a competent trainer from a qualified rope rigging school. While tripods are inherently stable due to their design, bipods and monopods are not. The later are totally dependent on their guying systems for support whereas the tripod will not require guying in most circumstances[4]. Obviously, the easiest set up for the AZV is to use all three legs. Real world demands dictates otherwise and the knowledge is needed.

TWO HIGH DIRECTIONALS IN ONE:

The AZV Multipod v.2.0 is really two high directionals in one. The head assembly will break apart into a gin pole head (orange[5]) and the A frame joiner (blue[6]) by pulling the joining head pins that are on the top of the unit. When putting these two pieces together again, be sure to place the gin pole and A frame joiner together using the TOP ½" holes (There are also two ½" holes below which are for a different purpose).

One AZV v.2.0 Multipod being used as two separate high directionals for a difficult confined space exercise atop an oil vessel at Shell Oil in Sydney, Australia. At right, AZV gin pole being used in tandem with AZV A frame on right. All guying shown was done with AZTEK kits.

The AZV user may decide that one or the other is desirable by itself or find that two high directionals are useful in tandem (as shown). For instance, an A frame may be used in a steep angle environment where front to back guying is easy to manage. In another set up, a difficult location in industry may dictate a monopod gin pole with simple guying due to space limitations. At other times, the user may want an SA frame (sideways A frame) out on a prominence that will not afford a third leg to the side. In any

[4] Guying is sometimes needed when changing angle of the rope plane at the high directional discussed later in this manual.
[5] In earlier versions of the AZV Multipod v.2.0, this part is orange)
[6] In earlier versions of the AZV Multipod, v.2.0 this part is blue)

case, extra time and extra guying materials are going to be needed. The simplicity of using a tripod without guying or the need thereof is fully realized in the end when such additional rope and equipment is packed in long distances.

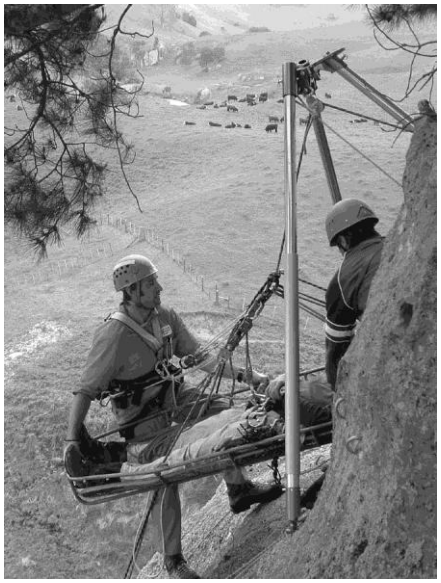
TYPES OF HIGH DIRECTIONALS THAT CAN BE MADE

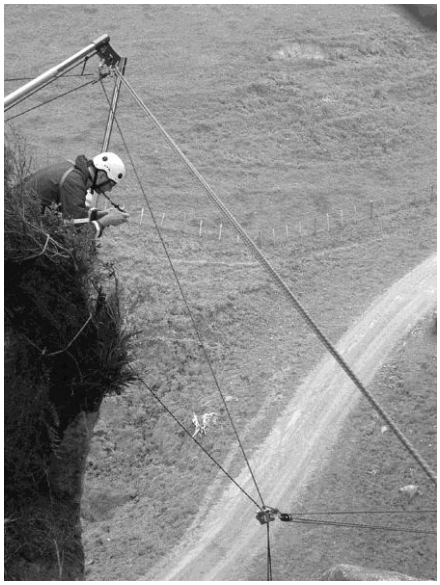
The AZV may be made into the following:

- Tripod
- Easel A frame (tripod
- Standard A frame (bipod)
- Sideways A frame (bipod)
- Gin pole (monopod)
- Tandem A frame/Gin pole (bipod/monopod)

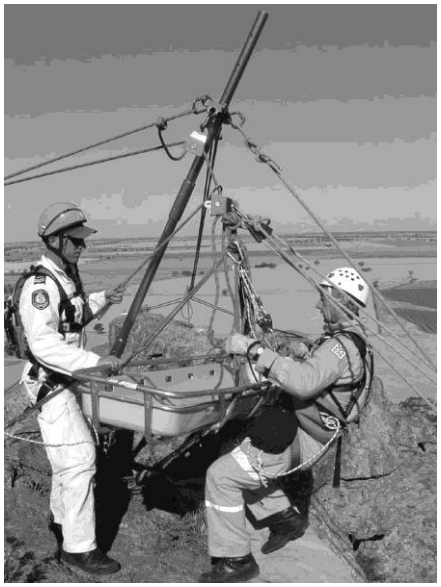
HIGH DIRECTIONAL TYPES

Tripod


Easel A frame


Standard A frame

Sideways A frame

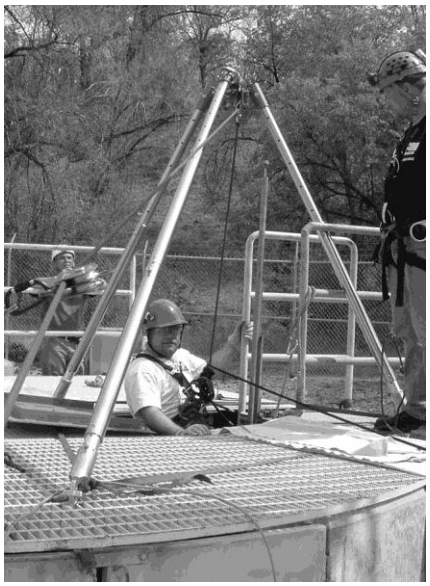

Gin pole

Tandem A frame/Gin pole

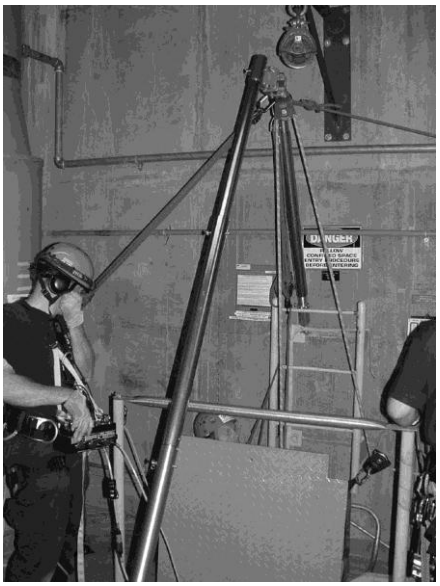
SETUP POSITIONS FOR THE AZV MULTIPOD: MANHOLES

The AZV may be set up directly over an opening and used as a conventional tripod. Perfect for workers or rescuers in industrial locations where most of these type entrances are found. However, these techniques may also be useful in mountain crevasses and small chimney-width clefts in rock with equal success. This is by far the most stable if the support for the load is kept directly downward and there is no force applied to the side which could tip the high directional over.

SETUP POSITION EXAMPLES:
OVER MANHOLES



AZV used as tripod:
Since easel leg was extended to cover the resulting force, no guying was needed but feet were still lashed to grating



AZV used as an SA frame:
Notice foot set against wall and butt block at bottom to direct forces straight down on the SA frame

AZV used as gin pole:
Gin pole set atop industrial vessel where room was limited. Again, as with first photo to left, a butt block was used to direct forces downward on the ole

SET UP POSITIONS FOR THE AZV MULTIPOD: EDGES

The AZV Multipod is also ideally suited for sending workmen or rescuers over an edge. In contrast to manholes where the force is pretty much straight down

The AZV (tripod, bipod and monopod) may be set up at different locations relative to an edge whether in industry or in the wilderness:

1. Back from the edge
2. At the edge
3. Over the edge

Discussion:

1. Back from the edge AZV setup: (= or > than 6 ft. back from edge)
    - Relatively easy to install high directional due to the fact that the AZV is being set up outside the hazard zone[7] where fall restraint must be applied
    - Requires additional rope protection at the edge since the AZV is set back from it

[7] The hazard zone is generally within 6 ft of the edge in most instances but may vary according to exposure and condition of surface. If a hand rail exists to restrict falls, the hazard zone is limited to that hand rail. If ice exists on a rock edge, the hazard zone may be greater than 6 ft.

- Less away from edge skidding force applied to the AZV. Front ties may not be required to hold the AZV from skidding on surface

2. At the edge AZV setup:
   - More difficult to install high directional due to the fact that the AZV is now in the hazard zone and practitioners must have travel restrict/fall protection
   - Requires no additional rope protection at the edge since AZV is set directly over the edge
   - More away from edge skidding force applied to the AZV. Front ties are mandatory
3. Over the edge AZV set up: (advanced technique)
   - Extremely difficult to set up as all involved are in the hazard zone and possibly supported by ropes

SETUP POSITION EXAMPLES:
EDGES

BACK FROM EDGE
This set up position is sometimes used for highlines and other offsets (Version 1.0 AZV shown)

AT THE EDGE
The most common setup position for the AZV but also requiring the most skill to negotiate

OVER THE EDGE (Experts Only)
Here a gin pole is guyed onto an edge 450 ft above the ground but still 80 ft from the top

STABILITY AND GUYING OF HIGH DIRECTIONALS

Guying:

Guying is accomplished by several methods and there is no limit to the amount of guys that a high directional may have. Basically though, whatever guys are placed for the AZV, make sure they are major anchors and do not skimp on their integrity. In our book, a minimum 2x1 anchor tied off is ample for EACH guy. If you use only one, make sure it is a good one. If the anchors are dubious, a 3x1 or even 4x1 may be needed. Tying off the distributing anchor so it is no longer distributing (called a fixed multipoint anchor) is best for if one blows, you can lose the entire lot and the high directional can come crashing down.

Guying comes in various forms:

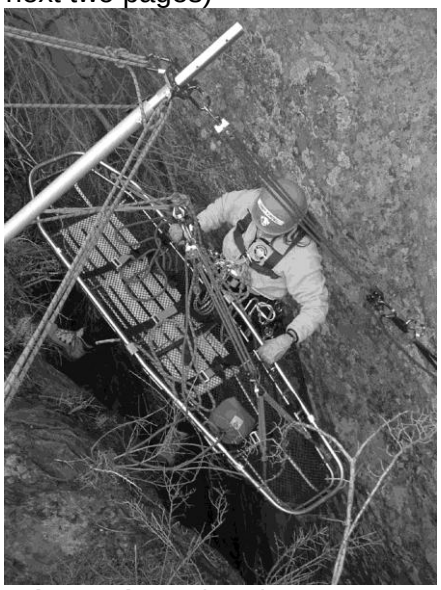
1 One (Single guy)
2 Two (Twin guying)
3 Three (Delta guying)
4 Four (Quad guying)

Guys, regardless of whether they are twin, delta or quad, are built from one of two types:

- Guys that ADJUST (called “adjustable guys”)
- Guys that TENSION (called “tensioning guys”)

EXAMPLES OF GUYING (see also next two pages)

Twin Guying: SA frame:
Both are tensioning



Delta Guying: Gin pole
All three are tensioning

Quad Guying: Gin pole:
Two adjustable and two tensioning

Generally, there is one adjustable guy on one side and, then, a tensioning guy opposing it in the other direction. The reason for this is simple. The high directional needs to be rigid before you load the ropes and run the operation. Under no circumstances should the device be floating around in the breeze having the rope system expected to provide the tension that is needed. This is in sharp contrast to some manufactured high directionals that do rely on the rope system being loaded to provide rigidity to the high directional[8].

[8] Like some uses of the Larkin Frame® made in Australia

ADJUSTABLE GUYS:

- These guys are generally single ropes (> 7/16” or 11.1mm) attached to the top of the A frame or gin pole in the correct quadrant (see photos) and the opposite end is attached to the anchor at ground level with a single 8mm triple wrap prusik. This prusik allows the adjustment in the angle of the A frame/gin pole.
- Other adjustable hitches may be used (like a clove) but all hitches must be tie off after the adjustment in the AZV is complete.
- An AZTEK or other small cordalette pulley system or jigger may be used as an adjustable guy (see photos)
- In the case where two adjustable guys are needed or one adjustable in combination with one tensioning guy, one rope may be often used with a small “jumper” loop at the AZV in between as to isolate each from the other.
- Adjustable guys are usually located at the quadrant that is most difficult to reach for adjustment.
- Keep angle of guy no closer than 30º to the pole you are guying to avoid a break-over lever. 45º or more is recommended.
- Tie off guy after adjustment

EXAMPLE OF GUYING (see also previous and next page)

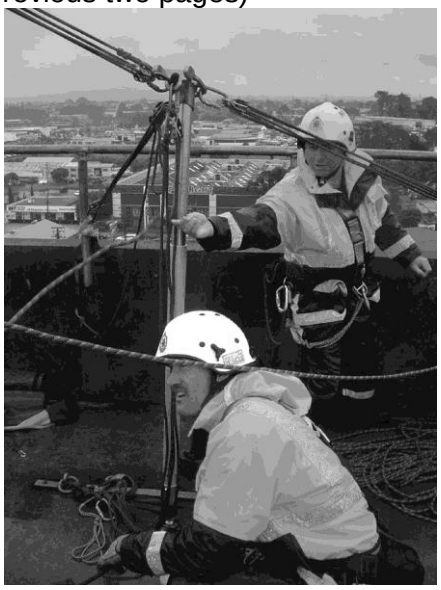
Quad Guying: A gin pole held in the front (left) with two adjustable guys using one rope with a jumper. On opposite side (right) two tensioning guys, again from a single length of rope, Notice the quadrants of the AZV gin pole head and the angle of the guys to the pole itself.

TENSIONING GUYS:

- These guys are generally doubled or tripled ropes (> 7/16" or 11.1mm) in the form of a non working pulley system[9] attached to the top of the A frame/gin pole in the correct quadrant (see photos) and the opposite end is attached to the anchor above or at ground level.
- A non working 2:1 or 3:1 is normally sufficient for tensioning
- Configure ratchet on non working pulley system so that all ropes are under tension (so that more than one single rope is holding the AZV)
- An AZTEK or other small cordalette pulley system or jigger may be used as an adjustable guy (see photos)
- In the case where two tensioning guys are needed or one tensioning in combination with one adjustable guy, one rope may be often used with a small "jumper" loop at the AZV in between as to isolate each from the other.
- Keep angle of guy no closer than 30º to the pole you are guying to avoid a break-over lever. 45º or more is recommended.
- Tie off guy after tensioning

EXAMPLE OF GUYING (see also previous two pages)

Twin guying: SA frame with two tensioning guys on right to left, parallel to edge
Zion National Park SAR

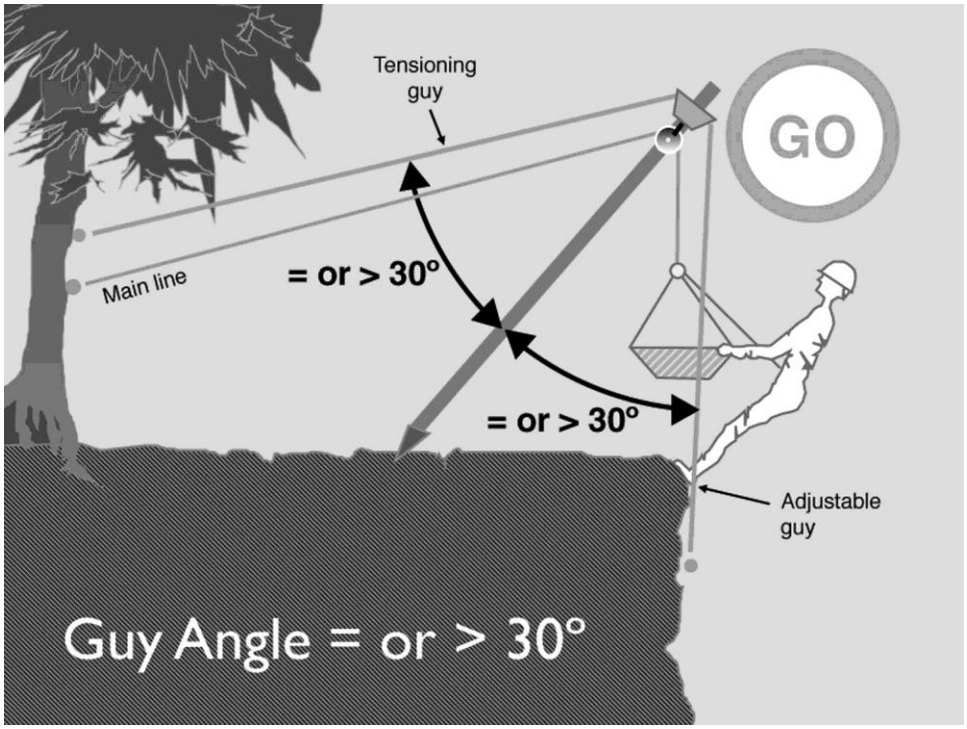


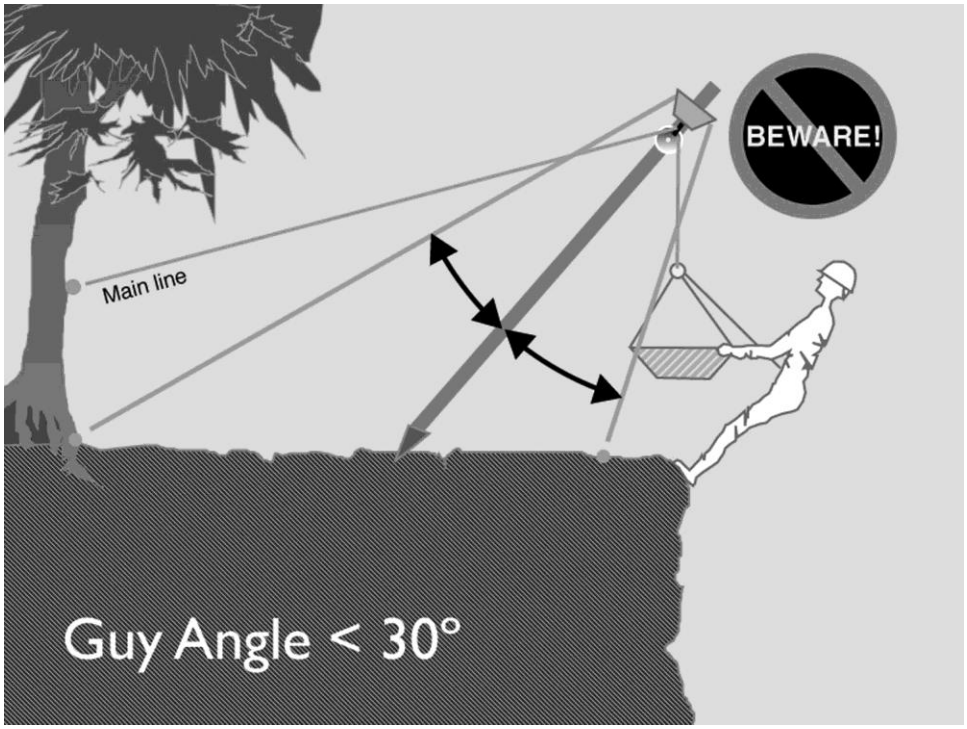
Delta guying: Gin pole with three tensioning guys built from AZTEKs.
Auckland Fire, New Zealand

Quad guying: Gin pole with two adjustable with one rope (left) and two tensioning guys on right.
Wharepapa, New Zealand

[9] Non working pulley systems do not use pulleys but, rather, rely, on carabiners and the friction they provide. These non working pulley systems are tensioned and set for the duration of the operation unless retightening is undertaken.

GUY ANGLE FOR A FRAMES AND GIN POLES



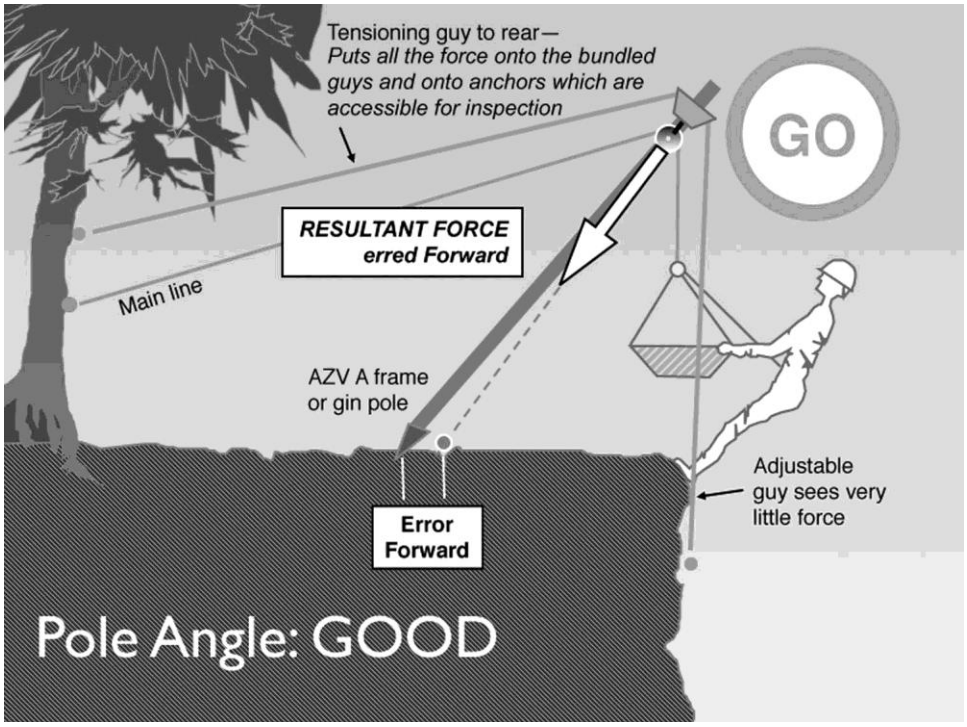


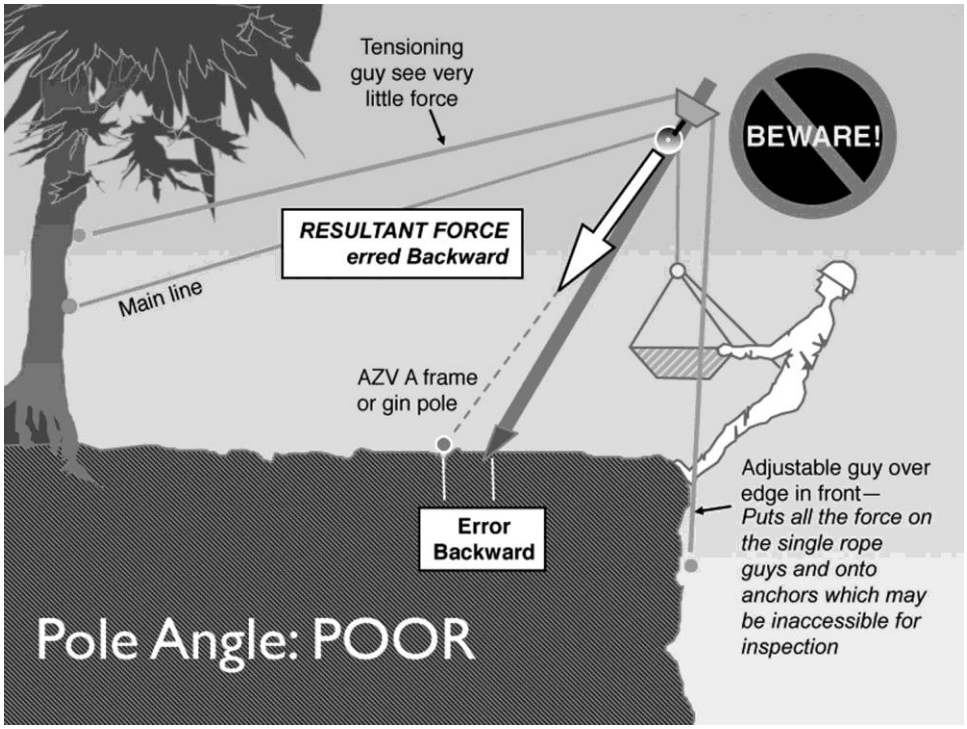
Guying angle relative the poles of a bipod or monopod is extremely important. The closer the guy gets to the poles, the more force is applied to guy, its anchor, and the poles themselves. This is referred to as a form of "break over" lever and is similar in function to a chain binder used to securely tie down heavy loads on large trucks.

As with guying of utility poles where force is applied to the top of a wood pole by conductors, gin poles and A frames are no different. Utilities know that the closer the guy to the pole, the more force it applies. Guys can fail, pull their anchorage out, or compress the pole to the point of buckling it. 30º angles as shown are considered a minimum and 45º is better but sometimes not possible.

Remember, the wider the angle between the guys and the pole or the plane of the poles (as in an A frame) the more stable the high directional will be.

ERRED FORWARD BIPODS & MONOPODS





Many times, there is a district possibility that those setting the Multipod up will err in anticipating the final resultant force. This is due to the fact that ropes going to and leaving the high directional are not in place when the guying is underway. If the angle of the A Frame or Gin Pole is not exact, it can put strains on the guying system. The danger then exists that if the front adjustable guy is not readily accessible for inspection since it is well over the edge many times; the entire high directional becomes dependant on this single anchor. To eliminate the possibility of this happening, it is recommended that the user error the Gin Pole or A Frame forward. This puts all the force on the rear guys which are normally tensioning anyway (hence triple or double ropes). The tensioning guys are readily inspected and will not stretch like the single rope adjustable guys to the front.

Bipods:

Bipods are stable in only one axis. A standard A frame (when the plane of the A frame is *perpendicular* to the main rope plane) is stable from left to right, hence guying should be front to back. The opposite is true with an SA frame (meaning that the plane of the SA frame is *parallel* to the main line plane). It is stable from front to back but not left to right. Hence, this form of high directional needs to be guyed to each side, somewhat parallel to the cliff or building edge.

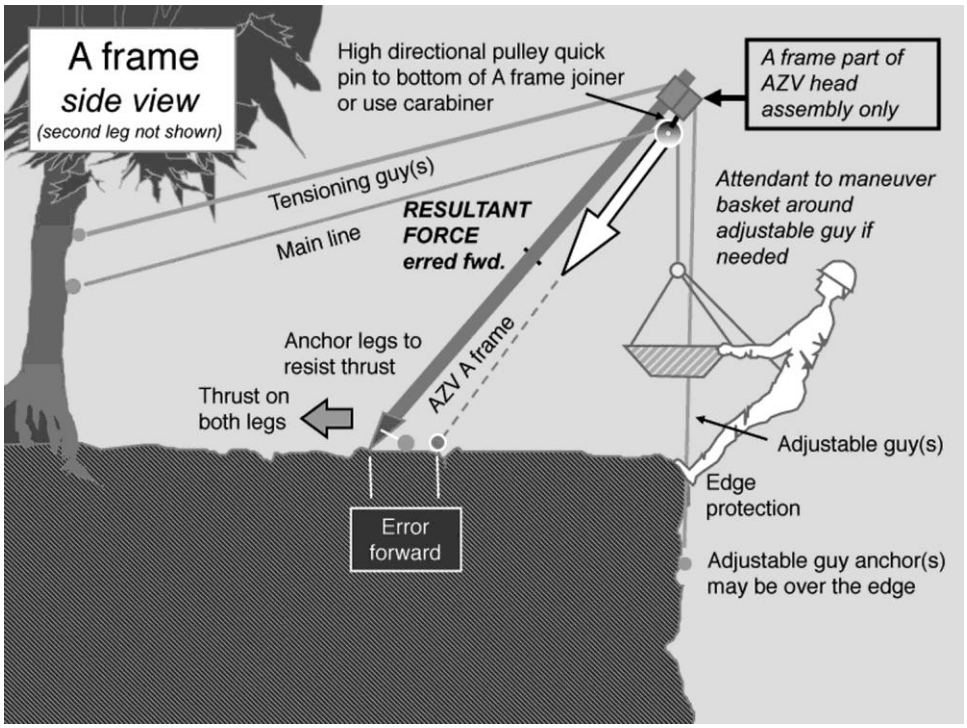
Bipods must be guyed in a minimum of two opposing directions.

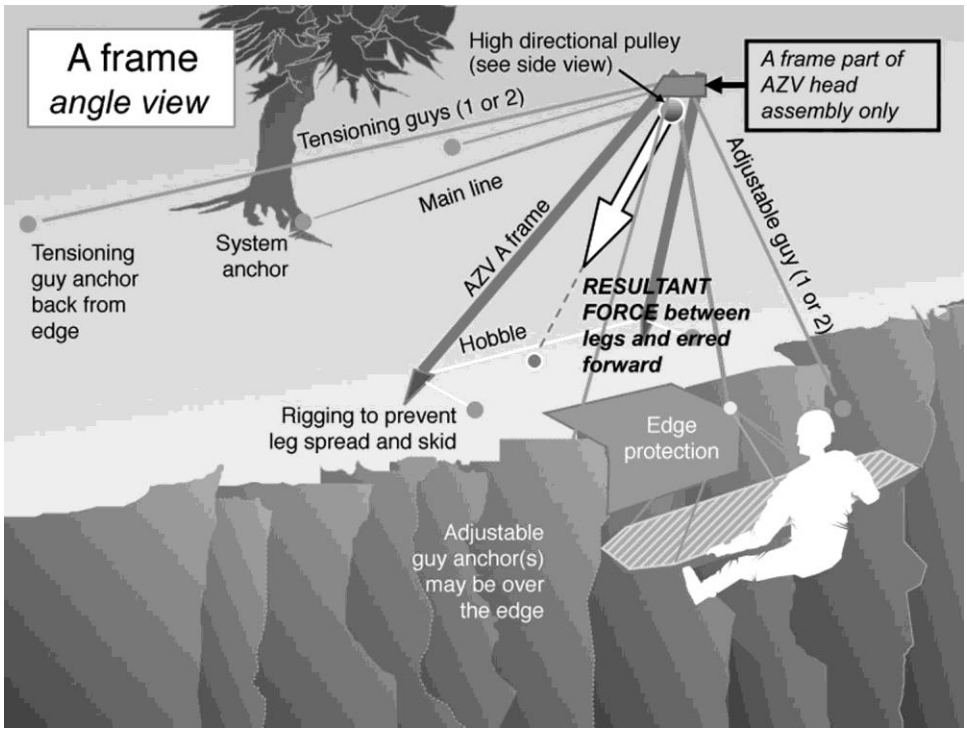
1 Twin guying (minimum)
- One to each side; front to back or left to right

2 Delta guying (good)
- One to front; two to the rear
- Two to the rear; one to the front

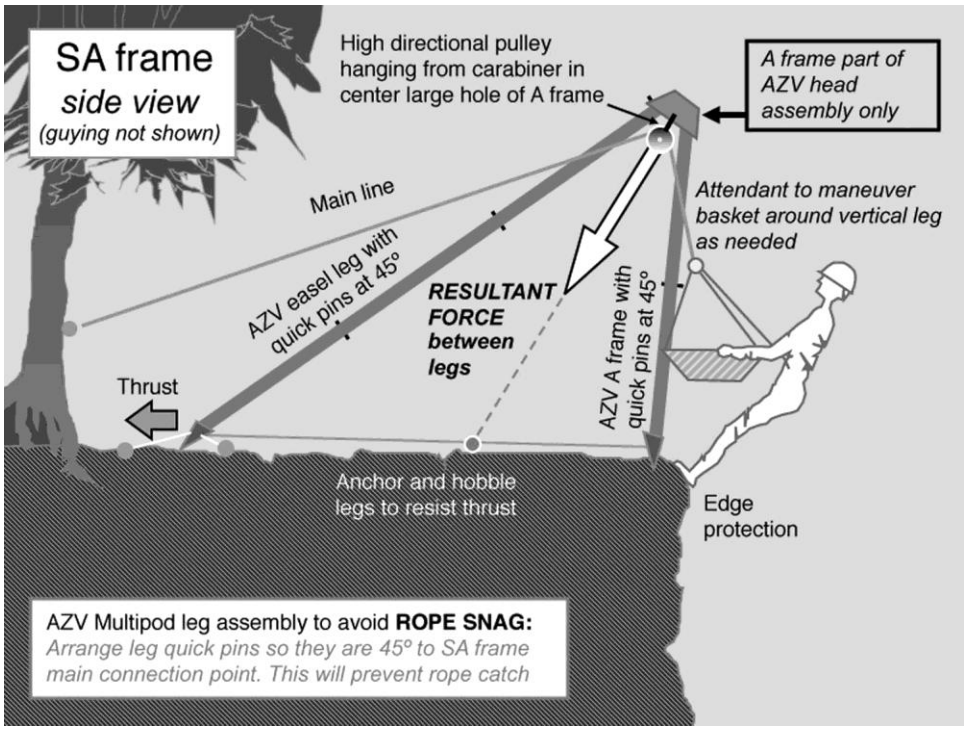
3 Quad guying (best)
- Two to the front and two to the rear

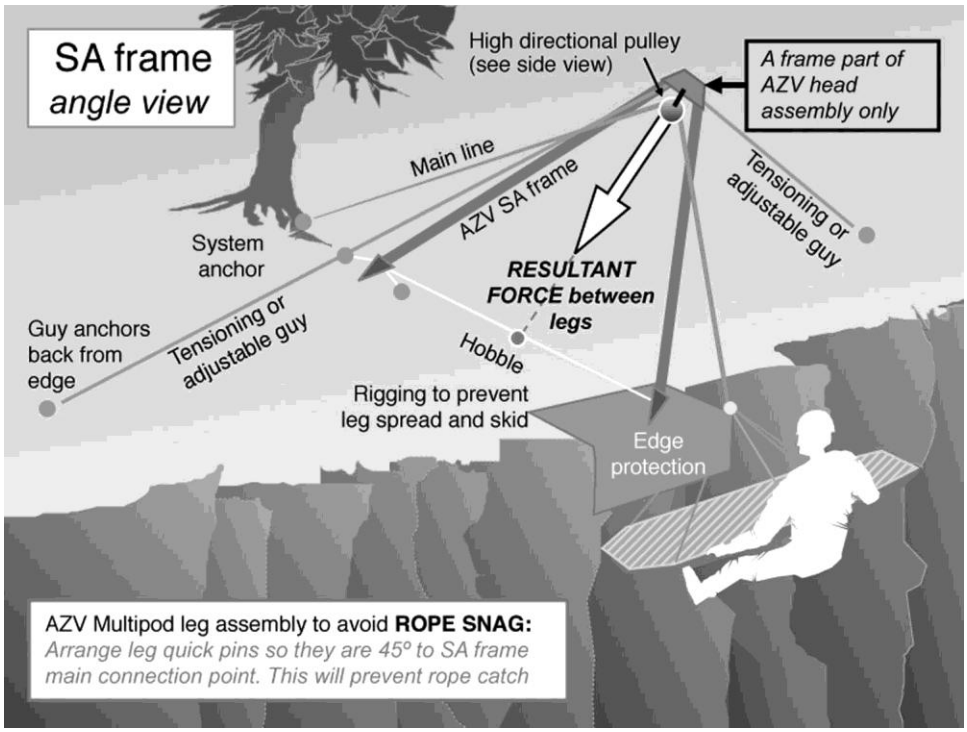
Bipod: SA Frame AZV being used as high directional by rescue team at Zion National Park, Utah in 2005 training with Ropes That Rescue


A frame
side view
(second leg not shown)
High directional pulley quick pin to bottom of A frame joiner or use carabiner
A frame part of AZV head assembly only
Tensioning guy(s)
Main line
RESULTANT FORCE erred fwd.
Attendant to maneuver basket around adjustable guy if needed
Anchor legs to resist thrust
Thrust on both legs
AZV A frame
Adjustable guy(s)
Edge protection
Error forward
Adjustable guy anchor(s) may be over the edge


A frame
angle view
High directional pulley (see side view)
A frame part of AZV head assembly only
Tensioning guys (1 or 2)
Main line
Adjustable guy (1 or 2)
Tensioning guy anchor back from edge
System anchor
AZV A frame
RESULTANT FORCE between legs and erred forward
Hobble
Rigging to prevent leg spread and skid
Edge protection
Adjustable guy anchor(s) may be over the edge

Since the standard A frame is stable left to right but not front to back, it is important to guy this AHD as shown with the front guy anchors as far forward as possible. Remember to keep the angle between these guys and the plane of the A frame itself greater than 30˚ to lessen the break over lever on the poles. When this anchor out in front is not trusted (for whatever reason due to its location) the A frame should be erred forward to take these anchors out of the equation as far as a critical point. Guying of an A frame can be twin, delta or quad. Tensioning guys are generally in the rear of this AHD due to the fact that it is easier for the team to tension them at this location. The A frame legs must be securely hobbled and anchored to avoid the backward thrust force on the legs as shown. The main line should also run at a 90˚ angle to the A frame (perpendicular) as much as possible.


SA frame
side view
(guying not shown)
High directional pulley hanging from carabiner in center large hole of A frame
A frame part of AZV head assembly only
Main line
Attendant to maneuver basket around vertical leg as needed
AZV easel leg with quick pins at 45°
RESULTANT FORCE between legs
AZV A frame with quick pins at 45°
Thrust
Anchor and hobble legs to resist thrust
Edge protection
AZV Multipod leg assembly to avoid ROPE SNAG:
Arrange leg quick pins so they are 45° to SA frame main connection point. This will prevent rope catch


SA frame
angle view
High directional pulley (see side view)
A frame part of AZV head assembly only
Main line
AZV SA frame
Tensioning or adjustable guy
System anchor
RESULTANT FORCE between legs
Guy anchors back from edge
Tensioning or adjustable guy
Hobble
Rigging to prevent leg spread and skid
Edge protection
AZV Multipod leg assembly to avoid ROPE SNAG:
Arrange leg quick pins so they are 45° to SA frame main connection point. This will prevent rope catch

Since the Sideways A frame is stable front to back but not left to right, it is important to guy this AHD as shown with the two side guy anchors to the sides. These locations are generally easy to access by riggers and therefore do not present the problems associated with the standard A frame (having to find anchors over the edge in front).
SA frame do not need to be erred forward as with A frames and gin poles since they are stable in this direction. This fact alone makes them the perfect AHD choice for rope systems employing track lines (highlines) or tracking line offsets.
Guying of an SA frame is generally only twin. A single tensioning guy to one side with an opposing adjustable guy (from one rope) is generally sufficient.
The A frame legs must be securely hobbled and anchored to avoid the backward thrust force on the legs as shown.

Monopods:

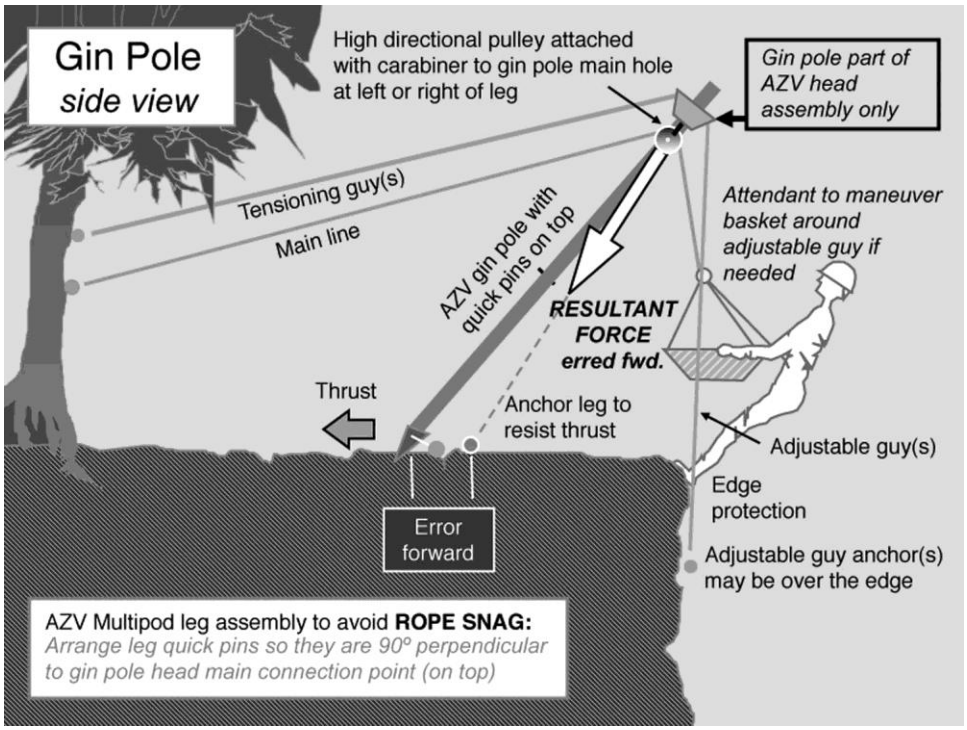
A monopod is not stable in any direction and will topple with great vigor when a load is applied to the device if the guying is incorrect. Guys must be applied in one of two ways to gin poles:

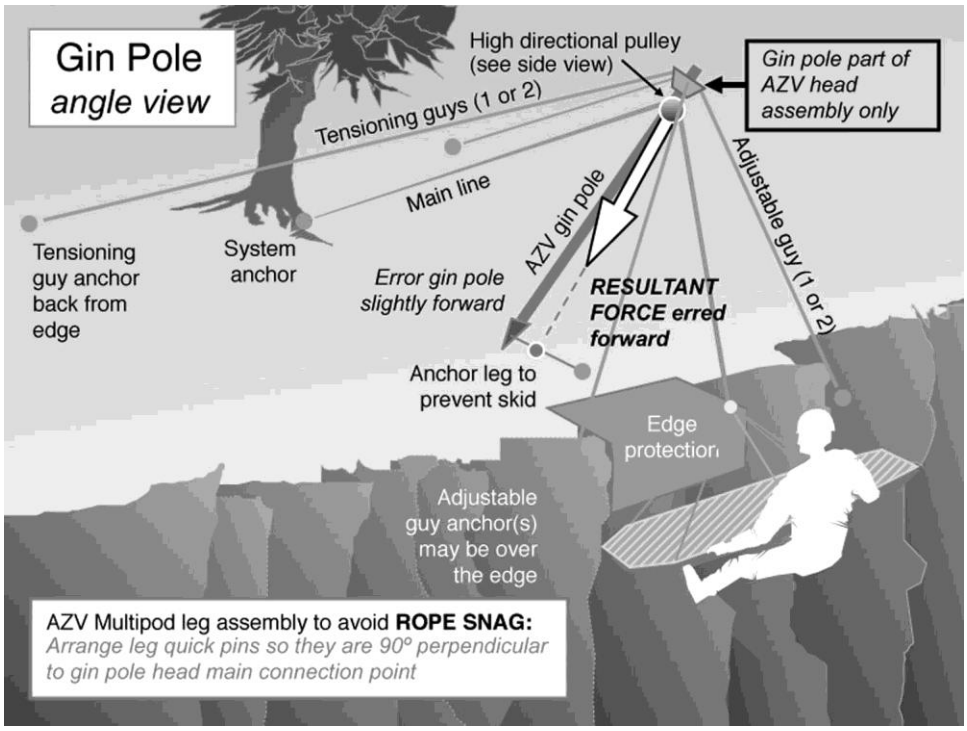
1 Delta guys (minimum)
- 120º angle between each of the three guys

2 Quad guying (best)
- 90º angle between each of the four guys

GUYING OF HIGH DIRECTIONALS

Monopod: Gin pole AZV being used as high directional by rescue team at Zion National Park, Utah in 2005 training with Ropes That Rescue


Gin Pole
side view
High directional pulley attached with carabiner to gin pole main hole at left or right of leg
Gin pole part of AZV head assembly only
Tensioning guy(s)
Main line
AZV gin pole with quick pins on top
Attendant to maneuver basket around adjustable guy if needed
RESULTANT FORCE erred fwd.
Thrust
Anchor leg to resist thrust
Adjustable guy(s)
Edge protection
Error forward
Adjustable guy anchor(s) may be over the edge
AZV Multipod leg assembly to avoid ROPE SNAG:
Arrange leg quick pins so they are 90º perpendicular to gin pole head main connection point (on top)


Gin Pole
angle view
High directional pulley (see side view)
Gin pole part of AZV head assembly only
Tensioning guys (1 or 2)
Main line
Adjustable guy (1 or 2)
Tensioning guy anchor back from edge
System anchor
Error gin pole slightly forward
AZV gin pole
RESULTANT FORCE erred forward
Anchor leg to prevent skid
Edge protection
Adjustable guy anchor(s) may be over the edge
AZV Multipod leg assembly to avoid ROPE SNAG:
Arrange leg quick pins so they are 90º perpendicular to gin pole head main connection point

Gin poles at the edge are the most time consuming of all AHDs. They are totally 100% dependent on their guying system. There must be at least a 30˚ angle between the plane of all guys and the pole itself otherwise this AHD becomes very stable. As with the standard A frame, the gin pole needs and depends on front anchor points. When this anchor out in front is not trusted (for whatever reason due to its location) the A frame should be erred forward to take these anchors out of the equation as far as a critical point. Guying of a gin pole can be either delta or quad. Tensioning guys are generally in the rear of this AHD due to the fact that it is easier for the team to tension them at this location. The gin pole foot must be securely anchored to avoid the backward thrust force on the legs as shown.

MULTIPOD LOADING CHART

The loading chart below will allow the user to obtain the greatest flexibility with the Multipod. In this chart, we have given loading at differing angles and with varying coupled lower legs (assuming a fully extended upper leg in each application). These are:

1. Equal-Sided Tripod (recommended)
2. Easel Frame (recommended)
3. A Frame (Advanced applications only)
4. Gin Pole (Advanced applications only)

EQUAL SIDED TRIPOD: Things to remember:

- If using the Multipod as an equal-sided tripod, you must load the head straight down where the ropes entering and leaving the high directional pulley are between 0º and a maximum angle of 15º so as to not topple the high directional during loading.
- Never exceed three lower legs in any application, regardless of load

EQUAL-SIDED TRIPOD		**Maximum Load**
		@ 0º to 15º rope angle Assuming a butt block pulley. Multiplier: 1.9 x
Lower Legs (all sides) (assumes one upper leg fully extended)	**1**	**600 lbs. (2.6 kN)**
	2	**300 lbs. (1.3 kN)**
	3	**150 lbs. (0.6 kN)**

EASEL A FRAME: Things to remember:

- If using the Multipod as an EA Frame you may load the head where the ropes entering and leaving the high directional pulley are between 60º and a maximum angle of 120º♦ so as to not topple the high directional during loading. Most applications use a 90º angle on an EA Frame and this is the value, along with 120º, given below.
- Never exceed three lower legs on the front A Frame application, regardless of load
- Never exceed four lower legs on the easel leg in any application, regardless of load

EASEL A FRAME			**Maximum Load**	
	EASEL LEG	A FRAME	**@ 120º rope angle** Multiplier: 1.0 x	**@ 90º rope angle** Multiplier: 1.4 x
Lower Legs (assumes one upper leg fully extended)	**2**	**1**	**1,200 lbs. (5.3 kN)**	**900 lbs. (4.0 kN)**
	3	**2**	**900 lbs. (4.0 kN)**	**600 lbs. (2.6 kN)**
	4	**3**	**300 lbs. (1.3 kN)**	**150 lbs. (0.6 kN)**

♦ In some highline applications, angles anywhere between 90º to 180º may be encountered

A FRAME (including SA Frame): Things to remember:

- If using the Multipod as an A Frame, remember that it may be used in any number of varying applications including angles of between 0º to 120º♦. Three values are given below
- Never exceed three lower legs in any application, regardless of load

A FRAME		Maximum Load		
		@ 120º rope angle Multiplier: 1.0 x	@90º rope angle Multiplier: 1.4 x	@0º rope angle Multiplier: 2.0 x
Lower Legs (assumes one upper leg fully extended)	1	1,500 lbs. (6.6 kN)	1,200 lbs. (5.3 kN)	900 lbs. (4.0 kN)
	2	1,000 lbs. (4.4 kN)	700 lbs. (3.1 kN)	500 lbs. (2.2 kN)
	3	700 lbs. (3.1 kN)	400 lbs. (1.7 kN)	200 lbs. (0.8 kN)

GIN POLE: Things to remember:

- If using the Multipod as a Gin Pole, remember that it may be used in any number of varying applications including angles of between 0º to 120º♦. Three values are given below
- Never exceed three lower legs in any application, regardless of load

GIN POLE		Maximum Load		
		@ 120º rope angle Multiplier: 1.0 x	@90º rope angle Multiplier: 1.4 x	@0º rope angle Multiplier: 2.0 x
Lower Legs (assumes one upper leg fully extended)	1	1,200 lbs. (5.3 kN)	900 lbs. (4.0 kN)	600 lbs. (2.6 kN)
	2	900 lbs. (4.0 kN)	600 lbs. (2.6 kN)	300 lbs. (1.3 kN)
	3	600 lbs. (2.6 kN)	300 lbs. (1.3 kN)	150 lbs. (0.6 kN)

♦ In some highline applications, angles anywhere between 90º to 180º may be encountered

HISTORICAL DEVELOPMENT

The general concept of the Arizona Vortex (or "AZV", as it had come to be known) was developed in the desert-alpine mountains of northern Arizona from expertise gained during the improvised rigging of wood timber frame "artificial" high directionals constructed for vertical rescue work. This initial work was accomplished during Ropes That Rescue Ltd. (RTR) seminars since the late 80's under the direction of Reed Thorne.

The first metal AZV prototype was an "easel-style A frame" welded together from heavy steel square tubing and plate at an Arizona copper mine fabrication shop in a 1996 RTR mine rescue program from plans scribbled out on a pizza restaurant table napkin. Although very heavy and cumbersome, it provided the test bed to prove and refine the design.

Early AZV prototype under intense scrutiny at 1997 Team Skills Rescue Seminar with Howard County Fire & Rescue (MD) at Harpers Ferry. Photo from RTR collection.

The next step in the evolution was the construction of an aluminum model based on more formal plans drawn by Thorne. This lightweight prototype was tested in four of the 7-day RTR rigging seminars before a third prototype was made. This prototype refined the adjusting system of the legs and introduced the “Raptor” foot design. Dubbed the Raptor because of its claw-like appearance, the shape of the foot helped direct the forces on the leg downward into soft soil often found in mines or wilderness locations.

Three years of use in rescue rigging seminars and rope access worldwide by RTR, Thorne developed further refinements of the concept with the help and exquisite craftsmanship of Rock Thompson of ROCK EXOTICA. Incorporating input from other users, the next evolution of the Arizona Vortex began to take shape. The Rock Exotica AZ Vortex Multipod is even more versatile and can be rigged as a tripod, a bipod, or monopod. The first testing of the new AZV Multipod was done by RTR at Mt. Arapiles, Victoria (Australia) during Dec. 2003 and in Sydney, Australia during an Industrial Rescue Workshop in March 2004. Many of the photos on this page are taken from these two RTR Australian seminars.

ADDITIONAL TRAINING

Training on the AZV Multipod with Ropes That Rescue Ltd.

Ropes That Rescue Ltd. is a technical rigging school based in scenic Oak Creek Canyon near Sedona, AZ. The school teaches technical climbing, vertical access and rope rescue all over the U.S. and Canada. Having been developed in these intensive seminars to wilderness and industrial applications, the Arizona VORTEX is a key element of the training by this company. If you or your rescue team desires additional training on the VORTEX to learn its full capabilities consider joining them for a rigging seminar in Arizona or elsewhere featuring this device.

For further information on the use and application of the Arizona VORTEX, contact Ropes That Rescue Ltd. in Arizona at (520) 282-7299 or visit their web site at:

http://www.ropesthatrescue.com/azvortex.htm
info@ropesthatrescue.com

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